

APPENDIX I: Background Information on the Structures and Functioning of the Natural Gas Production and Delivery Systems that Serve California and the U.S.

Appendix I.A: Natural Gas Markets: Natural Gas Resource Locations, Production, Pricing, and Storage

Natural gas is a colorless and odorless gas composed mainly of methane with other heavier hydrocarbon gases, and inert gases such as nitrogen and carbon dioxide. Natural gas accumulations exist underground and the major types of occurrence include dry gas reservoirs containing primarily methane, associated natural gas that is produced along with oil, and unconventional resources such as coal bed methane, and gas produced from tight sands and shale.

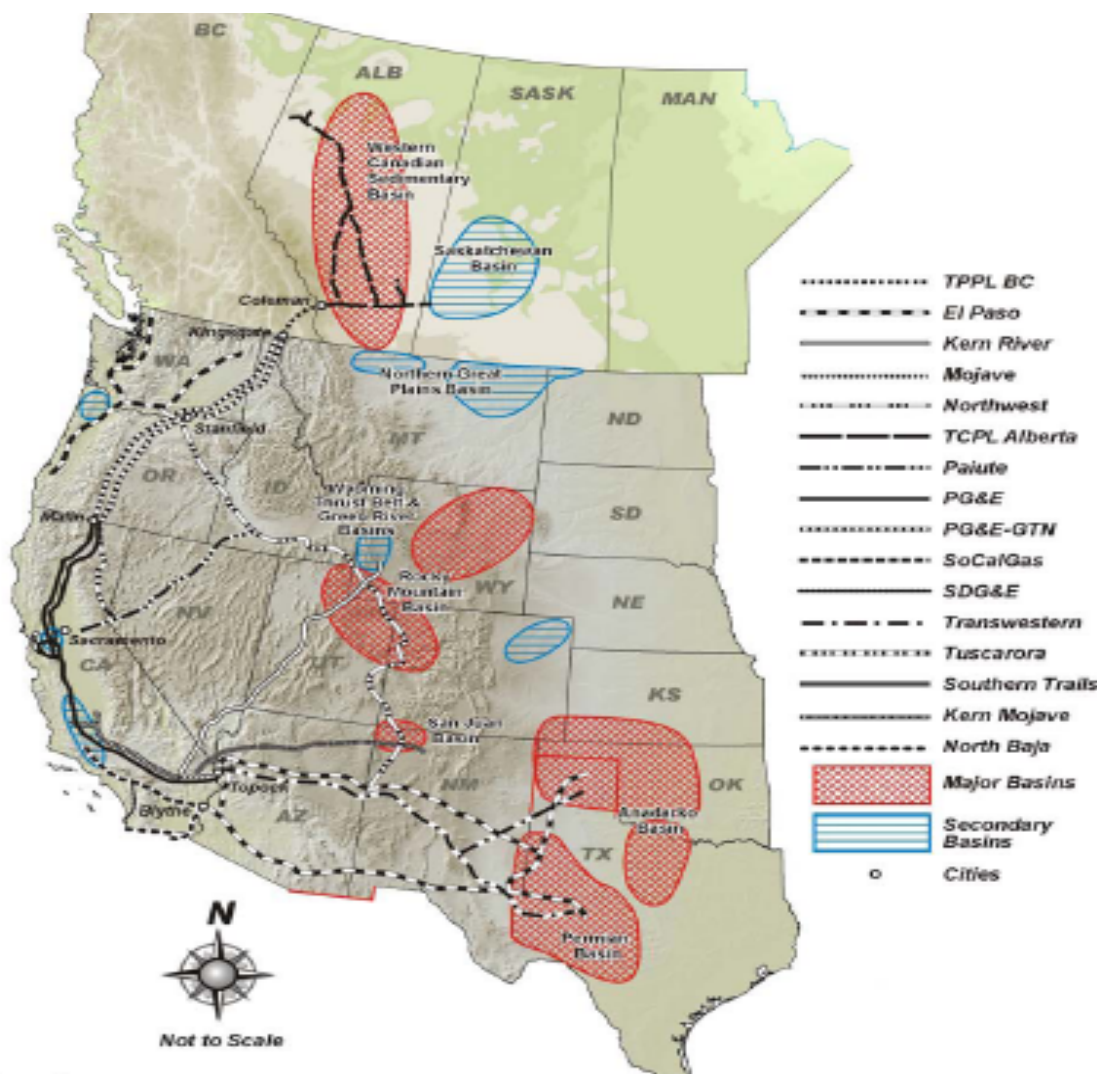
Natural gas is produced in the U.S., Canada, and Mexico and the amount of gas produced from each type of accumulation vary between regions and reservoir type. Figure 1.A-1 shows the major supply basins that provide natural gas to California and the pipelines that transport gas from the supply to demand regions.

After production, natural gas is processed to ensure that the quality meets pipeline quality specifications and is then transported over long interstate pipelines to be distributed to retail customers. During transportation and distribution of natural gas, a small amount of *mercaptans* (sulfur compounds that have a strong and pungent odor) are added to make sure that, any gas leak is immediately identified.

The major gas producing regions in the US are located in the Gulf of Mexico (both on- and of-shore) region, the Rocky Mountain region, the San Juan Basin, the Permian Basin, the Anadarko Basin, the Michigan Basin, and the Appalachian region.

California produces about 15 percent (historically about 1,000 million cubic feet per day (mmcf) of the total natural gas consumed in the state. With the recent drop in production levels in California, the domestic production has dropped to about 850 to 900 mmcf. Nearly half of the natural gas produced in the state is distributed by the utility companies to end users. The other half is directly provided to industry and electricity generation customers for their use.

Figure I.A-1: Natural Gas Supply Basins and Interstate Pipelines in the Western States



The other 85 percent of the natural gas consumed in California comes from the San Juan basin, the Rocky Mountain basin, and the Western Sedimentary basin in Canada. These supplies come to California via large interstate pipelines. Overall U.S. production ranges between 60 to 70 billion cubic feet per day (Bcfd), with California consumption ranging between 5.5 to 6.5 Bcfd.

Natural gas prices have been rising over the past four years. Normal trends are for prices to increase in winter months due to increase in natural gas demand. However, this winter has seen extraordinary price increases throughout the nation. Even though California prices have been lower than prices at other regions in the U.S., Senator Escutia's concerns about prices paid by the state's consumers are well founded and critical. The total value of natural gas consumed in California approached \$20 billion in 2005, rising from about \$7 billion in the early 1990s.

The Energy Commission and the CPUC, along with other state agencies, have been monitoring the state and national natural gas markets for several years. The inter-agency Natural Gas Working Group was formed during the 2000 energy crisis and has continued to monitor the state's natural gas market activities, price and supply trends. Currently the group meets on a monthly basis. Observed trends indicate that the current high prices are resulting from price movements on a national level rather than in California alone.

Although the pipeline capacity to California is adequate, demand for natural gas in the state has not seen any surprising surges this winter, and temperatures in the state have been close to normal, California's prices have risen along with other regional prices, but to a smaller extent. The price trends for California and the rest of the nation are discussed in detail in Appendix I.B.

Why Are the Natural Gas Prices Rising and Staying at High Levels?

Strong underlying "fundamental" market conditions and "seasonal" events help to explain why natural gas prices have been increasing and staying relatively high since early 2003. These factors include:

- The flat level of natural gas production in the U.S. and Canada despite very high levels of drilling
- A significant increase in the demand for natural gas for electrical generation
- Significantly increased costs of drilling since the mid-1990s
- Record high oil prices
- Seasonal events that changed the production and processing of natural gas in the largest gas producing region in North America, the Gulf of Mexico, due to hurricanes

The last factor is a major cause of recent and current high prices. Hurricanes Katrina, Rita, and Wilma have impacted natural gas production in the U.S. significantly. Never in the history of hurricane seasons have hurricanes disrupted natural gas production to this extent. In 2005, the hurricanes followed an abnormally warm summer (which caused prices to escalate due to high gas use for electricity production), and severely exacerbated the already tight natural gas supply-demand balance by removing more than 10 Bcfd of production. This is roughly 20 percent of the natural gas produced in the entire U.S. and caused the price of natural gas to dramatically increase in the weeks after the hurricanes. However, even though some Gulf production continues to remain off-line, adequate natural gas storage availability and warm weather have contributed to the price of natural gas dropping back to levels prior to the hurricanes ranging between \$8 to \$10 per Mcf. Normally, in the past, such disruptions due to hurricanes have caused price spikes but conditions have returned to normal within two to four weeks of the event. However, the damage caused by the hurricanes this season has followed a different trend. It is anticipated that the impact of the hurricanes may last over a longer period of time, as much as one year.

Even before the occurrence of the hurricanes, natural gas prices were high in all regions of the U.S. The first four factors listed above have been the major reason for nationwide high prices. Unlike the energy crisis of 2000-2001, when California was hit particularly hard by skyrocketing gas prices at the California border, California has actually enjoyed lower average prices than the rest of the U.S. over the past couple of years for a variety of reasons. The cost of interstate

transportation is not currently a problem, nor is there a hugely-inflated differential between the price at the California border and the price in the basin. In fact, the border price does not currently reflect the full tariff cost of firm interstate transportation.

The consistent high prices across the continent are due to the inability to find new sources of gas, high costs of drilling, and growing maturity of basins in the U.S. and Canada.

In addition, another change in the world natural gas market has caused prices to rise. For the past several years, liquefied natural gas (LNG) brought in by ships from foreign countries provided a cheaper source of natural gas. However, increasing global demand for LNG has now made it more competitive, providing more choices to the LNG marketers to take their LNG to the highest priced market. Thus, the LNG coming to the U.S. is also priced higher than in the past.

Price Forecasts and Discovery

While valid and reasonable factors explain the general, long-term increase in natural gas prices, we cannot yet quantitatively explain why prices are as high and as volatile as they've been. The two types of natural gas price indicators usually accepted by participants in the natural gas markets are the New York Mercantile Exchange (NYMEX)¹ futures prices and fundamental forecasts generated by state/federal organizations, consultant, and industry participants. Price forecasts generated by state/federal organizations, consultants, and industry participants evaluate the long-term fundamentals of the natural gas market while NYMEX futures prices provide market based indications of price magnitude and direction. Both of them serve vital price discovery functions. Differences in forecasting methodology can, however, produce different price trajectories.

Long-term price forecasts examine underlying fundamentals, such as reserve level, extraction costs, demand expectations, and transportation tariffs. Recent gas price forecasts based on assumptions about fundamental market conditions have been lower than observed prices. However, these prices do not compare nor reflect the short-term futures prices observed on the NYMEX. Market participants analyze long-term market requirements such as infrastructure needs using fundamental forecasts. As a result, short-term changes in market conditions do not influence the forecast outcome.

NYMEX prices, on the other hand, signal short-term market expectations. As a result, factors such as storage levels, weather changes, supply disruptions, and demands shifts can push prices in one direction or the other, sometimes resulting in high levels of volatility. Producers, marketers, consumers, and speculators trade natural gas for delivery in one month or out to sixty months. The prices produced from these transactions represent the interaction of expected supply and demand at the relevant delivery date. All market participants respond to changes in market conditions and execute trades meeting their requirements. Speculators, however, serve a special role. Though not trading for hedging purposes, speculators, according to the Commodity Futures Trading Commission (CFTC), "help...futures markets function better by providing liquidity." This group of traders, thus, assists hedgers (producers, marketers,

¹ NYMEX future contracts are standardized contracts for delivery of 10,000 MMBtu of natural gas for delivery at the Henry Hub in Louisiana.

consumers) with their risk management requirements. These transactions, as a result, promote price discovery, i.e., price expectations for the future months.

Some industry observers believe that the high degree of volatility in natural gas prices increase the likelihood of manipulation. Speculators, who may have no ownership stake in the natural gas industry, play a large role in the futures and options markets, and some believe that this phenomenon increases the possibility of price manipulation. However, the Energy Commission and the CPUC currently have no evidence of any such actual manipulation. The national interaction of expected supply and demand produces the observed price movements, but, as long as the possibility of price manipulation can't be excluded, regulators must continue the vigilant monitoring of natural gas markets.

In order to determine if price manipulation is actually occurring, an agency would need to have access to detailed transaction records related to purchases and sales between parties. The CPUC only has access to records where a regulated California utility is involved in a transaction. The FERC has the needed regulatory jurisdiction to obtain physical transaction data from market participants, and the CFTC has the regulatory jurisdiction to obtain financial data related to transactions in the futures and options markets that occur on exchanges. These two agencies would be appropriate to conduct such an investigation.

Natural Gas Ownership, Production, and Processing

The ownership of gas gathering and processing facilities is quite diverse through out the U.S. and Canada. They can be owned by the large integrated oil and gas companies, independent oil and gas producers, pipeline companies, and in some cases, they can also be owned by utility companies.

In the U.S., the federal government, state governments, Native American governments, and thousands of private landowners own mineral rights. In the Western United States, the largest mineral rights owner is the federal government. On the coasts, states own the mineral rights within three miles of shore and the federal government owns the areas greater than three miles from shore.

In the Western Canadian Sedimentary Basin in Canada, there are two principal types of resource ownerships: freehold, where the landowner owns the mineral rights because his/her family homesteaded and owned that land early in the 20th century; or government, including the Crown (federal government), Provincial, or aboriginal ownership.

In Mexico, the federal government owns all mineral rights. In addition, the federal government controls all exploration and production. This has led to a policy of neglecting natural gas production, and concentrating on oil because in the past, oil production provided a higher financial benefit.

The mineral rights owner can exploit the natural gas resource or lease the right to explore and produce the resource. When the mineral rights owner leases the rights, the percentage of

ownership leased to the production company can vary greatly, but typically leases terms tend to have the lessor retain anywhere from 16 to 25 percent of the value of the minerals extracted.

Large oil companies were the first large scale natural gas producers in the U.S. and Canada. Companies such as Humble, Amerada Petroleum, Gulf Oil, Atlantic Oil Company, Cities Service, and Sunray DX, discovered and produced a tremendous amount of oil and gas. In the late 1970s and early 1980s, many of the major oil companies moved overseas to explore and produce larger and more profitable reservoirs allowing more independent producers to increase their market share of domestic production. The domestic exploration industry is now dominated by a few remaining major integrated companies and many independent production companies.

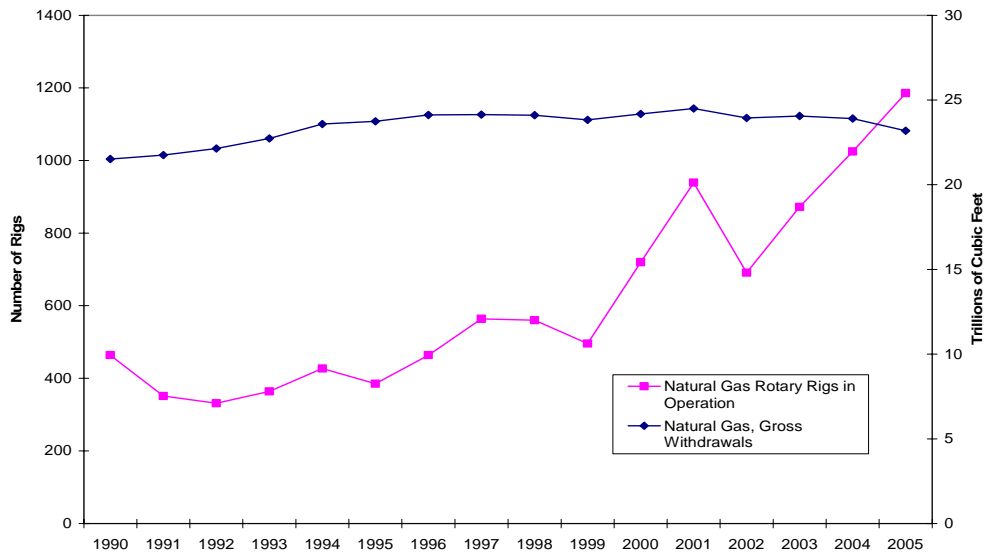
Table I.A-1: Top 10 Natural Gas Producers in U.S. and in California

Top Gas Producers in U.S.	Top Gas Producers in California
1. BP, PLC	1. Occidental of Elk Hills Inc.
2. ExxonMobile	2. Aera Energy LLC
3. Devon Energy Corp.	3. Calpine Natural Gas Co.
4. Chevron Texaco	4. Chevron Texaco
5. Conoco Phillips	5. Plains Exploration and Prod. Co.
6. Burlington Resources	6. Vintage Petroleum Inc.
7. Shell Exploration	7. Venoco Inc.
8. Anadarko Petroleum	8. Oxy Resources Calif. LLC
9. Kerr – McGee Corp.	9. Seneca Resources Corp.
10. Chesapeake Operating Inc.	10. Royale Energy Inc.

Status of Drilling and Natural Gas Production Levels

Conventional natural gas production from most of the mature supply basins in North America is declining or has only increased modestly since 1990, even though the number of wells drilled in the U.S. and Canada has been at an all-time high. As shown in Figure IA-2, in the U.S., between 1990 and 1996, the average daily gas well drilling rig count was 400 and the number of wells completed per year was 9,700. In contrast, between 2000 and 2002, the average daily rig count was 780 and 19,300 wells were completed.

Figure I.A-2: U.S. Production of Natural Gas and Drilling Activity



Source: Energy Information Agency

The amount of gas produced per well has been declining and the average estimated ultimate recovery per well (excluding nonconventional and deep water Gulf of Mexico supplies) fell about 15 percent between 1990 and 1999. The decline in production per well is, in part, the result of increased drilling within existing fields. Producers increase drilling in known areas for smaller pockets with less gas since the prices are high. These small prospects could not be accessed successfully before, as then low prices made it uneconomical to drill for the smaller prospects.

In contrast, production from some newer supply basins in the Rocky Mountains, East Texas, and deep waters in the Gulf of Mexico has increased. These production gains, with the exception of deep water Gulf production, are primarily due to production from unconventional resources such as coal bed methane, tight gas, and shale gas. These unconventional resources, as well as deep water production, have considerably higher completion and production costs. Consequently, not only are new supplies of natural gas more difficult to produce in large quantities, they are also becoming more expensive to produce. The increase in drilling costs has a significant impact on the increasing market price of natural gas.

A similar situation exists in Canada. The Western Canadian Sedimentary Basin (WCSB), the largest producing basin in Canada, is located mainly in Alberta and British Columbia. Production in the WCSB has also been flattening even though drilling activity has increased. Natural gas production from Eastern Canada is projected to increase but will remain a small percentage of total Canadian production. The emerging new natural gas source in Canada is the coal bed methane and shale gas production that is rapidly increasing in the WCSB. This production will help to offset declines in Canada's conventional production over the next few years.

Mexico has emphasized the production of oil and has done little to develop their natural gas reserves. In Mexico, natural gas production will remain relatively constant through the next 10 years at about 5 Bcfd with LNG imports growing from 0 to about 3 Bcfd.

Impact of Technological Improvements on Natural Gas Prices

Technology in exploration, development, and production of natural gas has continuously improved. Seismic technology has made dramatic improvements in exploration success with advanced processing of the data using ever more powerful computers. This, in turn, has led to the ability of explorers to find smaller and more subtle accumulations. Similarly, drilling and production methods have also improved. The recent use of Polycrystalline Diamond Compact (PDC) drilling bits has greatly increased the penetration rate and shortened the length of time necessary to drill a well. Production technologies, such as fracturing the producing formation by pumping in special liquids and horizontal drilling methods, have allowed for more efficient production of gas from coal beds, shale, and tight sands.

During the 1990s, these technologies had an immense impact on the price of natural gas. Technology development combined with the excess deliverable capacity that existed during those years helped keep prices low. In fact, natural gas prices stayed in the range of \$2.50 to \$3.50 per thousand cubic feet (\$/mcf) for over a decade. Since 2000, that trend has changed. The excess productive capacity no longer exists and producers have not been able to increase production levels despite drilling record numbers of wells. Consequently, natural gas prices have reacted quickly and have stayed high for the past 5 years.

Status of Natural Gas Supply and Delivery Infrastructure in California and Neighboring Regions

Natural gas supply to the U.S. comes from supply basins in the lower 48 states and Canada. In addition, gas is also supplied to the U.S. in the form of LNG from foreign sources to regasification terminals on the east and gulf coasts.

California currently obtains about 86 percent of supplies from out-of-state sources via major interstate pipelines. The remaining 14 percent is produced in California. Details of natural gas market assessments for the next decade are provided in the "Natural Gas Market Assessments" published by the Energy Commission in support of its *2005 Integrated Energy Policy Report*.

Consumers in the state depend on utility companies, direct deliveries from interstate pipelines or from local producers in the state. Regulated California utilities deliver about 85 percent of the natural gas consumed in California. End users that take the gas directly from California production and the major interstate pipelines serving California, consume the remaining 15 percent. Thermal enhanced oil production operations including cogeneration are the primary consumers of supplies delivered by the interstate pipelines. Local producers deliver the gas to a variety of consumers including some industrial and electricity generation consumers.

Since the energy crisis of 2001, additional interstate pipeline capacity to bring gas to California has been constructed. A major change is the doubling of capacity from the Rocky Mountain basin and the increase in capacity on the El Paso Southern System with the conversion of the All American pipeline. In addition, California storage capacity increased significantly by almost

41 Bcf providing a good buffer for the peaking winter months. California now has adequate pipeline infrastructure and in fact has substantial excess capacity.

Natural Gas Storage Operations in California and US

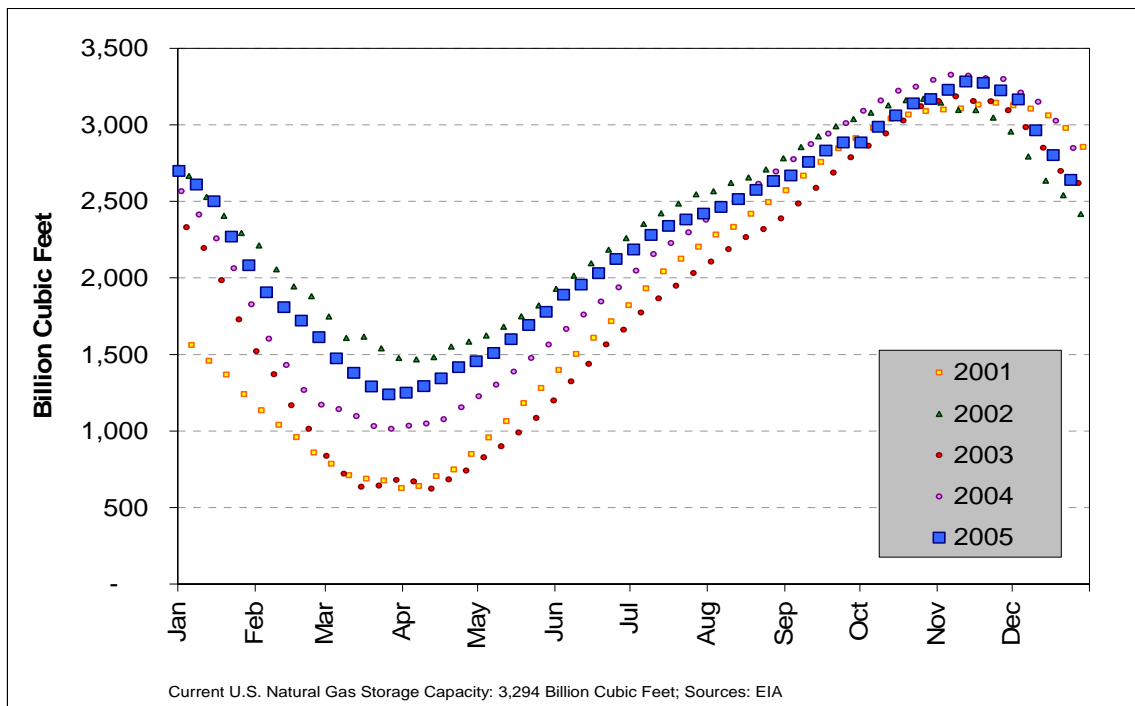
The purpose of gas storage is two fold. First, the utilities store natural gas to ensure that gas is available to the core customers in winter months when their demand peaks. Second, storage is designed to meet short term increases or decreases in demand in such a way as to maximize the use of pipeline capacity. Storage is vital for natural gas system reliability. Gas is purchased and pumped back into abandoned gas fields and stored until needed. During winter months as demand increases, pipeline gas is augmented with gas from storage to meet high demand. During spring and summer, natural gas demand is low and excess pipeline capacity is used to purchase gas and inject it into storage facilities for later use. In California, demand for natural gas rises again during summer months to meet the increased electricity generation for air conditioning needs.

Many gas storage fields are strategically located throughout the U.S. They are grouped together into three regions:

- The producing regions where storage facilities are close to the producing basins
- The Eastern consuming region where facilities are located in the consuming regions in the eastern states
- The Western consuming region in the western states of the U.S.

The U.S. has about 3,300 Bcf of total storage. This does not include any storage associated with LNG regasification facilities. Figure I.A-4 shows the seasonal storage capacity in the U.S. for the past five years. As indicated, storage levels nationally dipped following the hurricanes in October 2005, as stored gas was withdrawn to meet demand. Despite this withdrawal, national storage levels continue to be within the five-year average range.

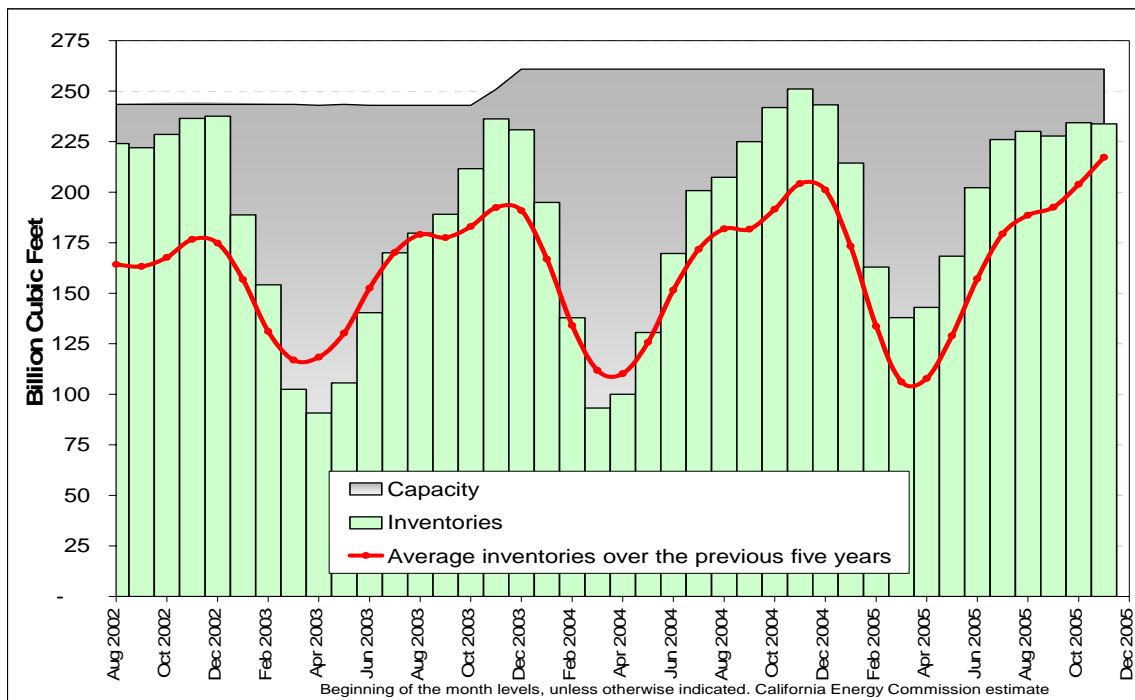
Figure I.A-4: U.S. Storage Inventories from 2001 through 2005



Currently California has a total storage capacity of approximately 261 Bcf. Southern California demand is met by storage facilities owned by SoCalGas Company. About 60 percent of the storage in these facilities is dedicated for core (residential and commercial bundled customers of SoCalGas) and the remaining capacity is used by other customers. Northern California has three storage facility operators, namely PG&E, Wild Goose, and Lodi storage facilities. PG&E, the largest of the three, primarily provides bundled storage services to the core customers and a small amount (about 15 percent) to other industrial and power generation customers. Wild Goose and Lodi are private storage facilities and mainly provide services to the industrial and power generation customers.

California experienced very low storage levels during the winter of 2001 when pipeline constraints and cold weather strained supply capacity to consumers in the state, resulting in increased withdrawal from storage. Since then, with the expansion of storage facilities and addition of pipeline capacity, storage capacity has been adequate. Figure I.A-5 shows California's natural gas storage capacity and inventory over the past five years.

Figure I.A-5: California Storage Capacity, Current Inventory and Average Inventories over the Past Five Years



Appendix I.B: Rising Natural Gas Price Appears to Have Overall Explanation in Market Conditions

In December of 2005, the national average consumer price of natural gas reached new highs. That California prices were less than the national benchmark² is of little comfort. Prices are substantially higher than in past years. Consumers want to know what is causing these high prices and what can be done about them.

Five factors contribute to California's and the nation's high natural gas prices:

- 1) Declining U.S. production
- 2) U.S. economic growth
- 3) Weather
- 4) Fuel switching due to high petroleum prices
- 5) Increased international demand and higher prices for LNG

Declining U.S. Production

Since 2003, U.S. production of natural gas has decreased. Production fell 0.6 percent in 2004 and is expected to decrease an additional 3 percent in 2005. This decrease has occurred despite the strong growth in well drilling brought about by price increases. While the number of rigs was at a record level during the summer of 2005, production has continued to fall.

Though production has declined over the past five years, the big decrease in production in 2005 is directly caused by last summer's hurricanes. Katrina and Rita caused significant service disruptions and shut down production and natural gas processing facilities in the Gulf of Mexico. Nearly 20 percent of U.S. production (as much as 15 Bcfd) was shut down in October following the two hurricanes. As of December 2005, more than 20 percent of the Gulf's natural gas production (about 6 Bcfd) continued to be unavailable to help meet the seasonal increase in natural gas demand. Gulf of Mexico production is a major source for natural gas in all parts of the U.S. The continued shutdown in production levels in the Gulf of Mexico will reduce natural gas supplies and put upward pressure on natural gas prices.

The Henry Hub (HH) spot price of natural gas is the price at which natural gas is traded at the Henry Hub exchange in Louisiana for immediate delivery. The price of natural gas across the country is frequently priced at a differential to the price at the HH. The difference can be positive or negative compared to the HH price depending on market conditions in various regions. Historically, California border prices have been mostly comparable to the HH price, however, during 2005, the California price has been significantly lower than the HH price. (During the energy crisis of 2001, California border prices were significantly higher than the HH prices.)

² The average of PG&E City Gate, Malin and Southern California Border Average was approximately \$1.40 per MMBtu less than the NYMEX Henry Hub spot price during the first two weeks of December.

The spot price of natural gas had increased before the impact of Katrina and Rita but as the effects of the storms were known, spot market prices increased immediately, reaching as high as \$15 per thousand cubic feet. Net imports combined with supplies from a healthy level of storage inventory were instrumental in making up for the decreased production. Net imports are expected to expand by only 1 percent in 2005 over 2004 levels.

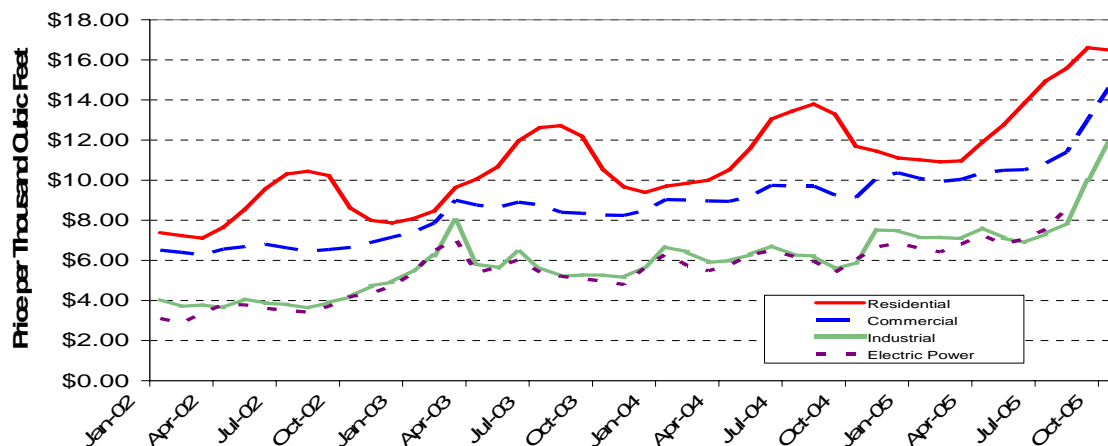
U.S. Economic Growth

Even with high energy prices which can slow economic growth, the U.S. economy expanded by 3.7 percent through the third quarter of 2005. With economic growth demand for natural gas increases to supply industrial and commercial uses as well as increased residential consumption.

Weather

Weather causes natural gas prices to vary seasonally. Figure 1.B-1 shows the natural gas prices seen by U.S. consumers for the last three years. Residential consumers typically pay more for natural gas in the winter. In California, the seasonal impact is usually less compared to the national average. However, unusual weather influences prices throughout the year.

Figure I.B-1: U.S. Average Consumer Price for Natural Gas



During summer the primary demand for natural gas is in electric generation. During hot summers, demand for gas increases to produce electricity for air conditioning. Peaking electricity demand is mostly met by electricity generation from natural gas-fueled power plants. Hence, even a modest increase in electric loads drives up gas usage significantly. On the other hand, winter is the peak season for gas usage nationally, including California. Since natural gas prices are set on a national basis depending on market conditions at all demand regions, on an average basis winter prices are higher than summer prices throughout the country. Further, natural gas prices also compete with heating oil prices during the winter months, especially in

the midwest and eastern regions of the U.S. The 2005 heating season resulted in significantly higher prices than expected with the cold weather in November and early December. As of the beginning of January of 2006, the season has so far been 1.1 percent colder than the 10-year average as measured by total heating degree days.

Fuel Switching From Petroleum Based Fuels

Some industrial and power generation consumers switch between natural gas and petroleum products (mainly heating oil) depending on prices. As crude oil prices have been extremely high and even set records in 2005, effectively all customers who had the option to switch away from petroleum products have done so. Thus, demand for natural gas in the U.S. has also increased due to increased usage of natural gas. Since global LNG and crude oil compete, higher prices for crude oil and petroleum products have also driven prices for natural gas and LNG higher.

Increased International Demand and Higher Prices for LNG

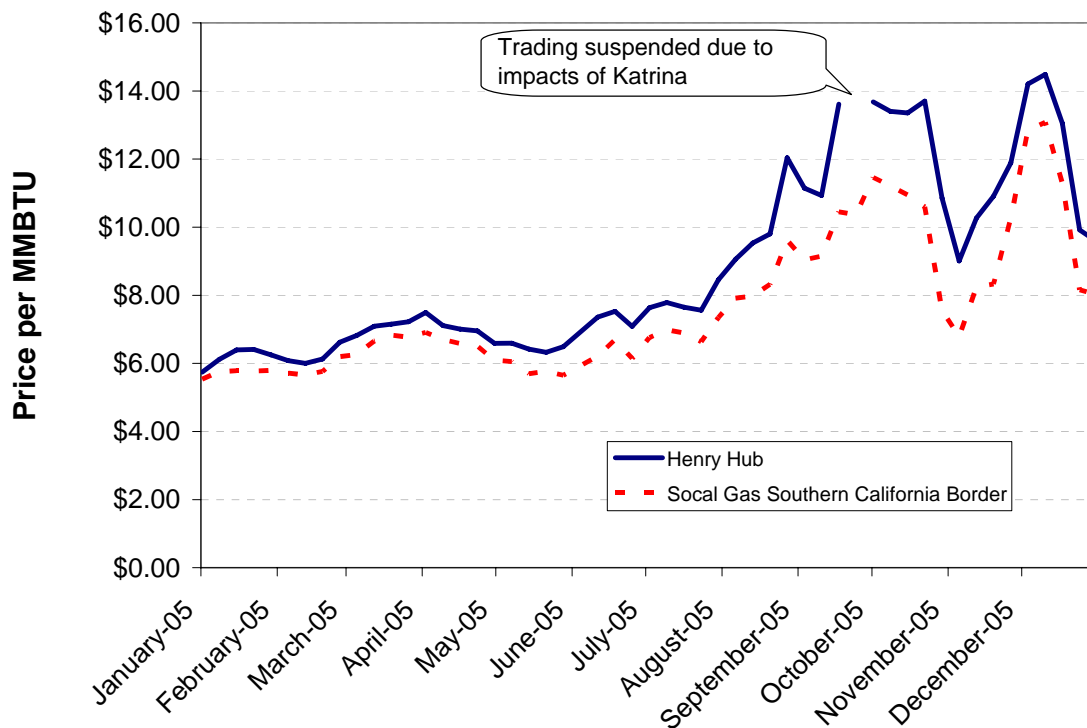
LNG is a global commodity and is now being traded on terms similar to crude oil in the global markets. While early LNG supplies to the U.S. were based on fixed price contracts, current LNG deliveries and contracts to the U.S. are more tied to price indices such as the HH in the U.S. or world crude oil prices. As natural gas prices in the U.S. increase so do LNG prices, since LNG is a “price taker” and not a “price setter” in the U.S. market. From a global perspective, cold weather and fuel switching have increased the demand for natural gas in Europe, with a consequent increase in natural gas prices. This increased demand and prices have caused some Caribbean production that would traditionally be delivered to the U.S., to be redirected to Europe and Asia. Though California does not directly import LNG, natural gas prices in California are affected as LNG is an important component of U.S. natural gas supply.

California Prices

The current high prices in California are substantially being driven by national and international events and trends. Figure I.B-2 shows Southern California Border, and Henry Hub spot prices. Because most markets that have multiple sources of supply and most producers supply more than one area, an event that affects one area also affects other areas. California does not receive natural gas directly from the shutdown wells in the Gulf of Mexico as a result of Katrina and Rita. However, increased competition in the basins that supply California has led to higher prices.

For the longer term, the Energy Information Administration (EIA) and the Energy Commission project prices to go lower than current prices due to increased supplies from nontraditional sources. NYMEX future prices also indicate the “markets belief” in a reversal of this trend.

Figure I.B-2: Comparison of Weekly Average National and Southern California Natural Gas Price



Market Manipulation, Market Power, and Strategic Supply Decisions

Some observers believe the level of prices cannot be supported by existing fundamentals. This has led to charges that the prices are being manipulated and calls for investigations.

California's natural gas markets have seen sharp price spikes in recent years. Consumer demand is fairly inelastic in the short term, that is, consumers respond only modestly to higher prices in the near term. When these sharp price increases result from seemingly minor events, the public questions the competitiveness of these markets.

California's wholesale natural gas markets are characterized by imperfect competition.³ Specifically, some firms in these industries may have the ability to exercise market power to varying degrees through withholding supply to affect market price. Such an industry structure is by no means unusual: few real-world markets are perfectly competitive.⁴ But a lack of perfect competition does not necessarily indicate a market without adequate competition.

³ As opposed to perfect competition, characterized by numerous relatively small firms that are "price takers"—the output decisions of an individual firm will have a negligible impact on market price

⁴ The best candidates for perfect competition are probably certain agricultural markets.

Because natural gas is so important to consumers and the economy, the idea of firms exercising market power (whether unilaterally or collusively) raises deep concerns. The exercise of market power may be thought of as the raising of prices in excess of their marginal costs when no shortage exists. Though sales will decrease with the higher prices, overall profits increase more from the higher prices than fall from reduced sales. When the market is “tight”⁵ and/or when prices have already risen to unusually high levels due to other circumstances (e.g., rising world oil prices, hurricanes) this is of particular concern to consumers.

The exercise of market power is not the only reason prices increase while no change in cost is observed. Though it may not seem fair, prices often increase while costs remain the same in competitive markets. Events unrelated to any firm’s actions can lead to increasing prices. Weather can lead to higher than expected demand. A supply disruption can restrict deliveries. Though sellers’ costs do not increase, the relative shortage is real and prices rise even though no firm is exercising market power. Prices respond not only to actual events but to expected events which may or may not materialize. An example of how important expectations affect natural gas prices occurs when National Oceanic and Atmospheric Administration (NOAA) produces a weather forecast indicating warmer or cooler than normal temperatures. Announcements during early December that weather would be colder than normal in the Northeast were followed by natural gas price increases. These price responses to expected events is part of a properly functioning market and creates incentives to conserve and build inventories in preparation of the higher demand driven by the cooler than normal weather. The higher prices encourage consumers to conserve in advance of the event, stretching the conservation out over a longer time rather than only responding after an event occurs. Overall this process allows markets to be less volatile.

Though rarely documented, the potential for price manipulation in commodity markets and natural gas markets exists. Illegal forms of price manipulation include collusion, manipulation of contract indices, and cornering a market.

Explicit collusion is an agreement between suppliers to set prices. It is illegal. As any crime, charges of collusion are investigated by the attorney general’s office under state and federal law. In natural gas markets, no evidence of explicit collusion has been found. However, tacit collusion is still a possibility. This discussion so far has addressed firms’ behavior when market conditions are tight, and not the circumstances that led to the market being tight in the first place. Tacit collusion, which is most effective when the level of competition is relatively low, could be a contributing factor to the tightness of the market. Therefore, more competition (and thus less possibility of tacit collusion) may reduce the sensitivity of the market to unexpected events.

Manipulation of natural gas indices was charged during the California energy crisis of 2001. Published gas prices were used to index contracts and to calculate mitigated market clearing price in California refund proceedings. The published prices were typically the average of prices reported by market participants for natural gas. Some market participants had incentives to over or under state prices with little oversight. Claims were made that some respondents attempted

⁵ “Tight” in this case refers to a case where refiners are operating very close to full capacity while discretionary (nonoperational) inventory levels are relatively low.

to manipulate the data used in building the indices. FERC investigated these claims and could not verify claims on manipulation of prices, but did conclude that the published price data was susceptible to manipulation and should not be used to calculate mitigated market clearing prices in refund proceedings.

Another form of market manipulation is a “corner” or “squeeze.” In this strategy an entity or group attempts to buy up a volume of contracts for delivery in excess of the volume available for physical delivery. This has been done in small illiquid markets. In the 2005 run-up of prices, prices have increased nationally on the NYMEX in excess of the markets directly supplying California. This would indicate that if manipulation were present, it was occurring throughout the nation. The volume of natural gas futures contracts traded on the NYMEX indicates that it is among the largest and most liquid worldwide commodity markets. There has been no clear evidence of this type of manipulation on the NYMEX.

At this point, the Energy Commission has insufficient information to conclude that any firm is exercising market power, individually or in concert, or to claim that this behavior has exacerbated California’s recent natural gas price increases.

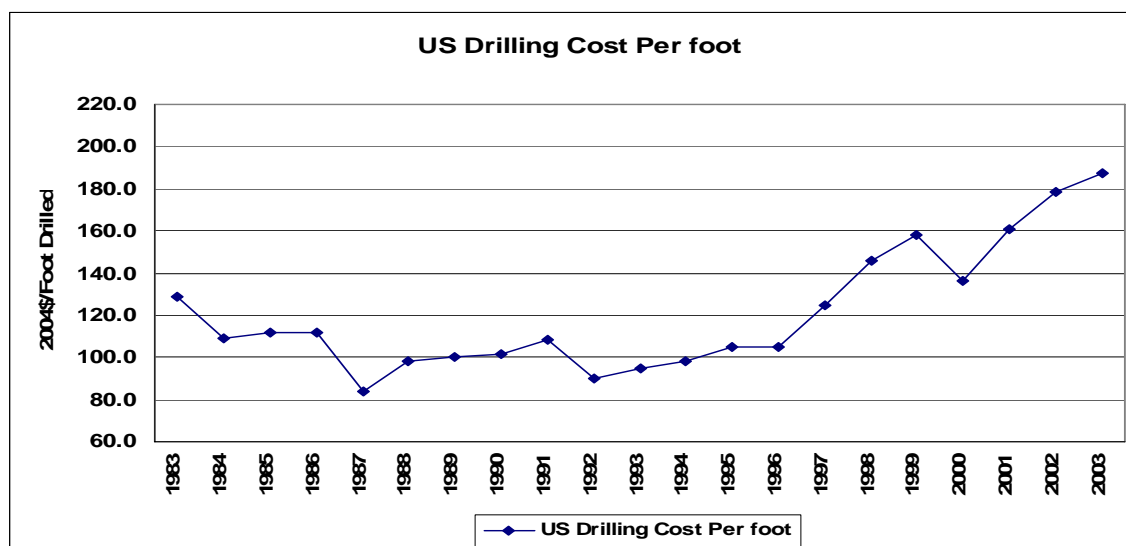
Appendix I.C: Factors Determining Natural Gas Prices

The supply and demand balance for natural gas determines its price, starting at the wellhead and ending at the consumer's burner-tip. However, many factors influence either supply or demand and hence the price of natural gas. These factors include cost of extraction (exploration and production), weather conditions, market expectations, unexpected changes in demand and/or supply, technological innovations, and overall performance of the economy.

Cost of Extraction (Exploration and Production)

Starting in 1983 and lasting until 1995, average cost per foot of well drilled in the U.S. declined and stabilized at about one hundred dollars. During this period, technology advances, along with discovering significantly sized natural gas reserves, lowered the cost of drilling. However, between 1995 and 2003, the cost per foot of wells drilled grew at over 8 percent per year, exceeding \$180 by 2003. If this trend continues, drilling cost per foot will approach \$200 in 2006. Figure I.C-1 shows US Drilling Cost per foot between 1983 and 2003.

Figure I.C-1: Drilling Cost in the U.S. (2004\$ Per Foot Drilled)



Weather Conditions

Weather variations drive natural gas prices more than any other factor. In winter, residential and commercial consumers demand more natural gas for space heating, thus placing upward pressure on prices. If winter temperatures sink below normal, added demand for natural gas can push prices to higher-than-normal levels. On the supply-side, very cold conditions can freeze wellheads, lowering production levels leading to higher natural gas prices.

During the summer months, power generators demand increasing volumes of natural gas to generate electricity used for air conditioning homes and businesses. In summer 2004,

temperatures exceeded normal averages by about 17 percent, forcing generators to purchase larger volumes of natural gas for their power plants. The increased cooling-related demand pushed wholesale natural gas prices to higher-than-expected levels.

Market Expectations

Changes in market expectations usually drive prices higher or lower. Expected changes in nationwide natural gas storage levels demonstrate this behavior. To hedge against price increases during the coldest days of the winter months, natural gas utilities purchase gas during warm-weather months, and store it for use during the heating season when natural gas demand swells. Market participants track the variation in storage levels. If storage levels fall short of market expectations, prices tend to rise to reflect potential tightness during the rest of the season. Conversely, prices may fall if storage levels exceed normal levels. Natural gas traders anticipate price movements and then execute purchases based on their beliefs. These market transactions push prices higher or lower. Similarly, other changes in market conditions such as changes in pipeline maintenance and operations and maintenance schedules or outages of nuclear power plants, produce market behaviors which can affect natural gas prices.

Unexpected Demand and/or Supply Changes

Since 1997, power generation demand for natural gas has experienced growth exceeding 4 percent per year. This demand explosion has placed upward pressure on U.S. natural prices. During this period, the number of gas producing wells increased, but overall U.S. production flattened, and even declined in some regions. Existing basins are maturing, exhibiting declining production profiles. Producers are seeking smaller natural gas pools at greater costs per unit of production. Taken together, these activities lead to higher-than-normal price levels.

Further, the effect of large-scale hurricanes can push prices to higher-than-normal levels, as demonstrated by Hurricanes Katrina, Rita, and Wilma. The Gulf of Mexico provides about 20 percent of U.S. natural gas production. In late summer 2005, Hurricanes Katrina, Rita, and Wilma pounded the Gulf Coast, knocking out about 40 percent of its production (almost 20 percent of U.S. consumption). Prices rose, reaching \$15.00 per Mcf. The loss of production in the Gulf could sustain higher-than-normal price levels for at least one year, if not longer. These unexpected events changed the overall price profiles.

Technological Innovation

Technological innovation lowers the unit cost of production of any product, including natural gas. In the last 15 years, the oil and gas industry has introduced several innovations, including slim-hole drilling, 3-D seismic, horizontal drilling, and more efficient drill bits. Taken together, these innovations have kept prices lower than they would have otherwise been. While these advances helped to keep natural gas prices at low levels during the 1990s, they have not been sufficient to offset price increases due to the decreasing supply levels and dissipation of the gas bubble.

Overall Performance of the Economy

Natural gas fuels about 25 to 30 percent of the U.S. energy demand. All sectors (residential, commercial, industrial, and power generation) of the U.S. economy consume natural gas. This fuel provides energy needs in American manufacturing industries such as steel, glass, chemicals, textiles, automobile, food, and other products. A robust economy increases demand for natural gas and, conversely, a stagnant economy depresses demand. Since the early 1990s, the U.S. economy has been expanding, averaging about 3 percent per year. This expansion has added upward pressure on natural gas prices.

Overall Price Effect

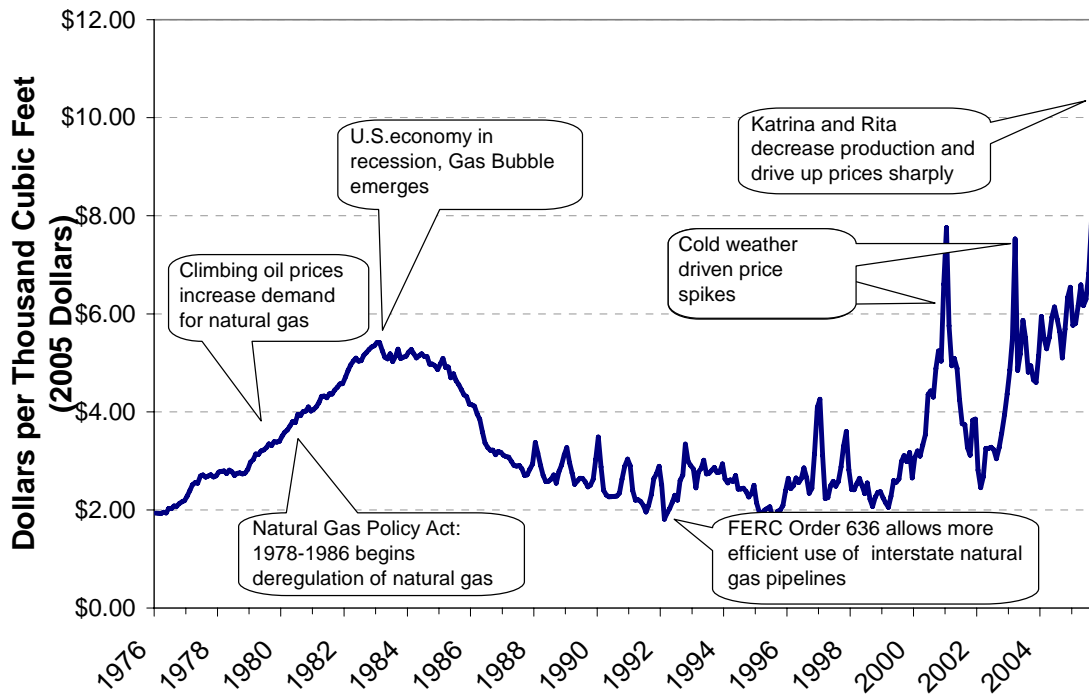
Overall, the above-mentioned factors can impact natural gas prices in the short term or the long term. Seasonality and weather factors contribute to short-term variations. Price spikes caused by these factors can be short lived, with prices bouncing back to normal trends in less than six months. However, depending on the severity of the event, markets can experience higher-than-normal natural gas prices for longer periods. Alternatively, long-term infrastructure project additions or deletions including pipelines, storage facilities, and LNG facilities, can influence natural gas prices over longer periods.

Natural Gas Prices – Progression from Wellhead to Burnertip

Wellhead price of natural gas includes costs incurred during exploration, drilling, development, and production. The wellhead price also includes the costs necessary to process the raw gas to ensure it meets pipeline quality specifications and compressor costs to bring the gas up to the pipeline's operating pressure.

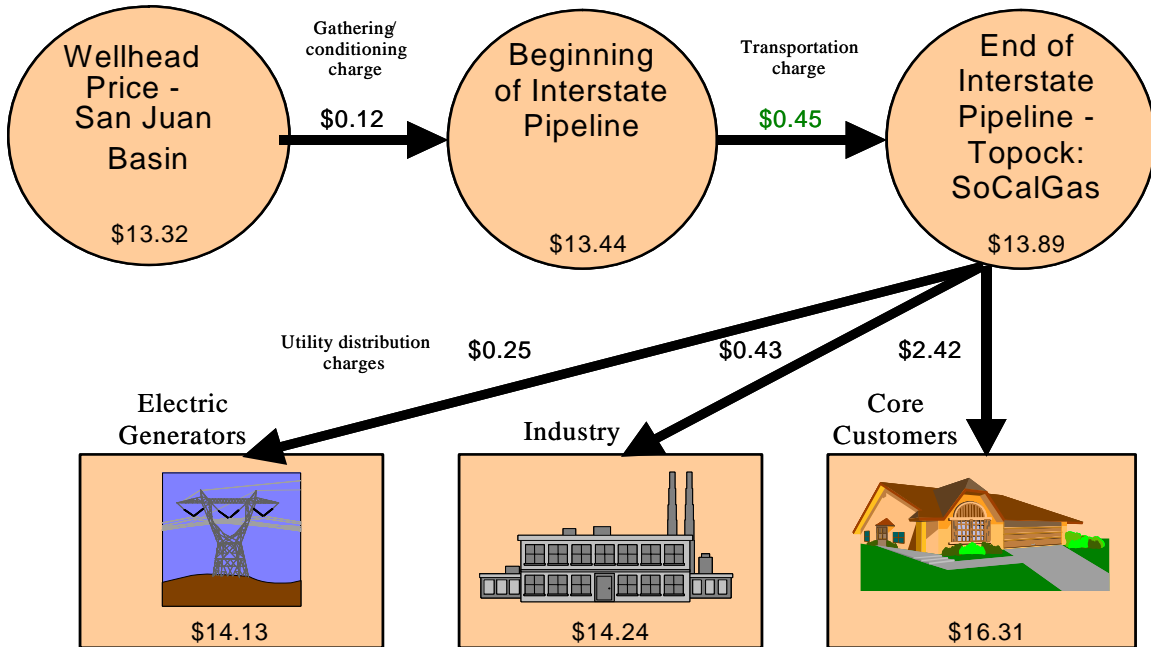
Natural gas competes in the national market (and in the global market, including LNG) and depends on additional factors such as prices at other supply basins, pipeline capacity to transport the gas from the supply basin to the demand regions, and supply options available at each demand region. Figure I.C-2 shows the history of wellhead prices. The schematic includes events that affected the magnitude and direction of price trends.

Figure I.C-2: Historical U.S. Annual Average Natural Gas Wellhead Prices



After production and processing, natural gas is compressed and transported along high pressure interstate pipelines to distribution locations. At this point, some consumers such as large industrial and power generators take gas from the interstate lines while the rest of the natural gas is transferred to local natural gas utility pipelines for distribution to their customers. Figure I.C-3 demonstrates the chain of gas movement and it's pricing from the wellhead to the burnertip.

Figure I.C-3: Natural Gas Pricing Chain from Wellhead to Burnertip



The information in this graph, based on published pricing data observed on December 13, 2005, is for illustration only. While the industrial and electricity generation prices are representative of actual market prices, the weighted average cost of gas (WACOG), calculated on a monthly basis, determines the final price that utility customers--mainly residential and commercial customers--pay for natural gas.

Appendix I.D: Financing Options Available in the Oil and Natural Gas Industry

Firms operating in the oil and natural gas industry require a significant amount of funds to finance their exploration, development, and production activities. These funds can be obtained from the firm's operation or through debt and equity financing. The sources of funds available to a firm for its capital and operating expenditures are:

- **Internally Generated Fund** – These funds are derived from a firm's cash flow. A firm's cash flow is composed of net income, depreciation, and changes in accounts receivable, liabilities, inventories, and other operating activities.
- **Debt Financing** – The firm borrows the funds necessary for development with a repayment schedule. These loans can be short term, less than one year or longer term and up to seven years. The advantage to the firm is that the lender does not gain ownership interest in the project and the firm's obligation is limited to repayment of the loan.
- **Equity Financing** – This form of financing allows the firm to obtain funds without incurring debt. The disadvantage to equity financing is the dilution of ownership interest.

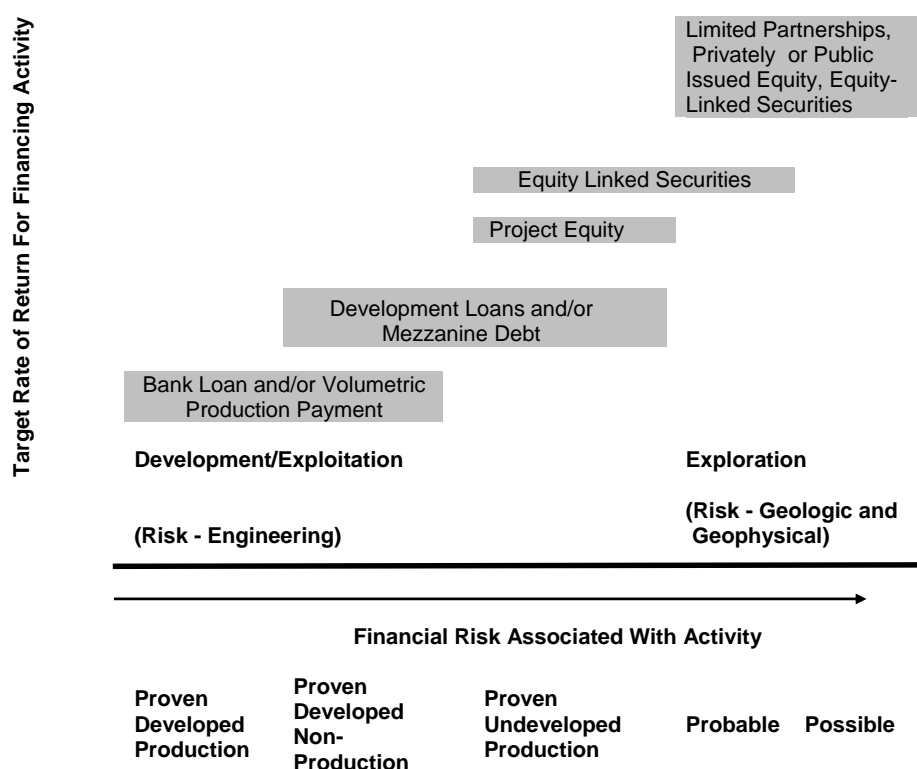
Firms in the industry are operating in one or all three phases of oil and gas activity. These phases are exploration, development, and production. The expenditures in the exploration phase have three major activities (a) geological and geophysical data and evaluation, (b) land acquisition and rental, and (c) exploration drilling. These expenditures are considered high risk expenditures as no proven reserves have been identified that can be developed for production.

The expenditures associated with the development phase are (a) development drilling, and (b) well completion. Expenditures for this activity have a much lower risk than exploration expenditure as natural gas reserves capable of being produced have been identified.

The production phase expenditures consist of (a) pipeline gathering system, (b) natural gas plants for processing the natural gas to meet pipeline specifications, and (c) possible secondary recoverable or pressure maintenance activities. This phase of activity has the least risk, as the reserves have been drilled and tested with the expenditures being used to establish the infrastructure necessary to transport the gas to market.

As indicated, each of these activities have a different degree of risk associated with the expenditures to find, develop, and produce natural gas, as shown in Figure I.D-1. The risks associated with the different phases of activity have resulted in a number of financing options available to a firm. The different financing options have been developed to allow the lender to earn a greater return dependent on the risk associated with the activity. Firms may use all or part of the different financing option shown in Figure I.D-1. The type of financing options available to a firm depends on the firm's ability to sustain its operation in a way that will allow for repayment of the finances incurred.

Figure I.D-1: Oil and Gas Industry Financial Risk and Expected Rate of Return



Large integrated oil and natural gas producers (such as ExxonMobil, Chevron and ConocoPhillips) and large independent natural gas producers (Apache Corporation, Anadarko Petroleum Corporation, etc.) with excellent credit ratings are able to finance much of their activity through the firm's cash flow and by obtaining debt through commercial banks, syndicated loans, and the bond market (public and private placement). These funds can be used for general corporate expenditures or project financing, where the loan is backed by a specific project and does not require other company assets as collateral to support the debt.

Smaller firms that do not have the asset base or cash flow to give a lender assurances that the loan can be repaid, normally use mezzanine debt, equity linked security, limited partnerships or the selling of a working interest in its operation to finance their expenditures.

As shown in Figure I.D-1, the production phase has the lowest risk and therefore, the lowest costs. The development phase has a higher risk as the production performance of producing wells and the extent of associated reserves is less defined. The risk associated with the development of reserves increases as the natural gas reservoir does not have a production history, well completion costs have not been defined, and the amount of natural gas that can be produced cannot be determined until reservoir properties and production history have been established.

Firms with sufficient known reserves can obtain financing through normal banking channels using the syndicated loan market, issuing debt through private or public placement, or by using a volumetric production payment. Active institutional investors in the syndicated loan market are pension funds, endowments, foundations, and financial institutions. The risk associated with the use of debt financing is ensuring that the natural gas wellhead price is high enough to generate the cash flow necessary to repay the loan. A producer can reduce the price risk in the natural gas market by selling the gas forward, executing 'swap agreements', and/or through the use of financial derivative instruments.

A derivative instrument is a financial instrument which derives its value from the value of some other financial instrument or variable. Companies use derivative instruments such as futures, swaps, and options and physical delivery contracts with the purpose of protecting profit from exposure to a decline in the market price and to minimize the variability in cash flow from a portion of its gas production.

Futures contracts are normally used to fix the price of expected future natural gas sales at major trading locations such as Henry Hub, Louisiana. Swap agreements are normally used to fix the price differential between the price at Henry Hub and various other market locations. Options are used to establish a floor and/or ceiling price for future gas production.

The risk associated with financing debt with future gas production is determining what the future price of gas will be when the gas is produced. Both the firm and the lender would like to have some level of confidence that funds will be available to service the debt. The price risk can be reduced through the use of option contracts. One method to accomplish this is through the use of what is referred to as a two-way collar.

A two-way collar is a combination of options, a sold call and a purchased put. The sold call option establishes a maximum price or ceiling. A call option gives the buyer of the options the right to purchase from the firm the contracted option amount of gas at the strike price over a specified time period.

The firm then establishes a floor for gas production through the purchase of a put option. The put option allows the firm to have the right, but not the obligation to sell an agreed upon amount of gas at a specific price. The two-way collar allows the firm to have price certainty within the range. The collar establishes a protected price band.

The firm could choose to obtain financing through the use of a volumetric production payment. A volumetric production payment is a contract in which the producer is provided financing for which the producer agrees to repay with a specified volume of future production. This agreement is similar to the use of a futures contract or forward selling contract except that the price risk is passed to the financing entity.

The development phase can be financed with development loans and/or mezzanine debt or some combination of the two. Development loans are normally associated with project financing. This type of loan relies on the reserves used as collateral and the only recourse that the lender

has (in case the loan goes into default) is to take possession of the assets associated with the project. Project financed loans are repaid from the cash flow generated within the project.

Mezzanine debt is a form of financing that is a hybrid of debt and equity financing. Mezzanine financing is normally used to finance development of proven reserves and it is debt capital that gives the lender the rights to convert to an ownership position in the project or obtain an equity interest in firm. If the lender converts to an ownership or equity position, the lender forgoes all or part of the loan repayment. Again repayment of mezzanine debt is through the cash flow generated from the project after it is in production.

The remaining financing methods are project equity, equity linked securities, limited partnerships, and the privately placed equity are normally used by the smaller independent producers. For the firm that has a project with proven undeveloped reserves, the use of project equity, or the selling of a working interest or overriding royalty in the project is a method to obtain funding for development.

For projects relying on probable reserves where the development risk is higher, the financial investors are normally willing to accept the higher risk in return for a greater return. This is done by linking the financing to a loan that can be converted to an equity position or obtaining an equity position in the project. The equity linked financing method is normally used by the mid-to small-size firms to finance the development of (1) proven undeveloped reserves, (2) delineation and proving of probable reserves for development, and (3) acquisition of acreage in areas that have natural gas potential.

Another financing option available to these firms is the use of limited partnerships, which offer an advantage to the limited partners (firms) by allowing them to limit their liability associated with the project, yet participate in a project that if successful offers a high return. The firm can obtain low cost financing for their project, giving in return, part of the financial reward if the project is successful.

Generally, developers of infrastructure projects such as interstate natural gas pipelines attempt to ascertain market interest in the project through non-binding “open seasons”. If enough interest is obtained, the project may then be proposed to the FERC for approval (along with other appropriate agencies). If FERC approval is obtained, market support is then sought in the form of binding contracts. If enough market support is obtained, financing is then arranged, and the project is constructed.

With regard to financing for infrastructure constructed by regulated utilities which are natural gas distribution utilities, such as distribution and transmission pipelines, financing is typically obtained through retained income or debt and equity issuance. If facilities are proposed outside the utilities’ service territory or if preapproval of the costs for large projects is sought, a utility may seek authorization from the CPUC before constructing the facilities.

Natural gas storage facilities may be constructed with first obtaining an Energy Commission determination that a project is “necessary,” if the developer is willing to take the risk of cost

recovery for the project. Wild Goose Storage and Lodi Gas Storage facilities were both constructed in this manner.

Two recent examples of financing for major infrastructure projects are discussed below:

2003 Kern River Pipeline Expansion Project

Project Description: MidAmerican Energy Holdings Company completed a \$1.2 billion expansion of the Kern River natural gas pipeline system in May 2003. MidAmerican is 80.5 percent owned by Berkshire Hathaway Inc. A minority owner, Walter Scott, has voting control.

The Kern River pipeline system is one of four major pipeline systems that directly serve California. The system totals 1,679 miles of pipe and transports natural gas from the Rocky Mountain states to Utah, Nevada, and California. The 2003 Expansion Project increased the pipeline system's capacity from 845.5 Mmcfd/d to 1.7 Bcf/d.

Financing: MidAmerican financed the expansion project using 70 percent debt and 30 percent equity. On June 21, 2002, the company closed an \$875 million credit package with a group of banks. The leading lenders were Credit Suisse First Boston, Commerzbank, and Union Bank of California. The financing was underpinned by binding agreements for over 900 million cubic feet per day of incremental service. The credit facility included a two-year construction facility followed by a term loan with a final maturity of 15 years after completion of the expansion project. On May 1, 2003, a MidAmerican subsidiary retired the credit facility by issuing \$836.0 million for 4.893 percent of Senior Notes with a final maturity date of April 30, 2018.

Lodi Gas Storage Facility

Project Description: In the fourth quarter of 2001, the Lodi natural gas storage facility was completed. The project includes an underground storage facility and associated facilities located 5.4 miles northeast of Lodi in San Joaquin County. The facility has a working storage capacity of 17 billion cubic feet, 400 Mmcfd/d maximum firm injection capacity and 500 Mmcfd/d maximum firm withdrawal capacity.

Financing: On November 5, 1998, Lodi Gas Storage, LLC (LGS) filed an application at the CPUC to construct a natural gas facility.⁶ At the time, LGS was owned by limited partnerships led by Haddington Energy Partners, a privately-held energy investment firm. On May 18, 2000, the CPUC granted the company approval to build the facility.⁷ The private investors did not disclose the amount they intended to invest in the project. According to a subsequent filing with the CPUC, the total equity value of the facility was approximately \$105 million at the beginning of 2003, although the amount invested by the equity owners may have been more or less than that.⁸ In January 2001, shortly after announcing the signing of a long-term firm agreement to supply Calpine Corporation with storage services, CIT Structured Finance agreed to provide

⁶ A.98-11-012.

⁷ D.00-05-048.

⁸ D.03-02-071.

LGS up to \$50 million in non-recourse financing to construct the facility.⁹ Construction of the facility commenced in the first quarter of 2001, and was completed in the fourth quarter of 2001. On February 27, 2003 the CPUC approved an acquisition of a 50 percent interest in LGS by another energy investment firm, ArcLight Capital Partners.¹⁰ Then on December 1, 2005, the CPUC approved ArcLight's acquisition of the remaining 50 percent ownership in the gas storage facility.¹¹

⁹ Haddington Ventures, L.L.C. press release dated January 11, 2001 and "Lodi Gas Storage lands financing for facility development." Houston Business Journal January 17, 2001.

¹⁰ D.03-02-071.

¹¹ D.05-12-007.

Appendix I.E: Role of Financial Markets

Some analysts of the natural gas market have expressed the view that the futures market is being increasingly and heavily traded by financial institutions that have little direct role in the natural gas industry, and this activity may be one of the causes of high prices. Such institutions may be simply speculating on short-term price movements in the market, or protecting certain short-term positions they may hold, while having little interest in or control over physical assets or the physical natural gas commodity.

It is certainly true that trading in the natural gas futures and options markets has grown tremendously since it was first introduced in 1990. For example, the volume of NYMEX traded futures contracts has increased from roughly 20,000 per day in the mid 1990's to roughly 50,000 per day in 2000 to over 100,000 per day currently. Natural gas open interest futures contracts increased from about 200,000 in December 1995, to over 600,000 in 2000, and remained roughly at that level since then. The role of "non-commercial" traders has also increased in recent years. Interest in the natural gas financial market by speculators could be expected as the volatility increased. (Non-commercial traders are speculators, aren't directly involved in the natural gas industry, and are hoping to profit by speculating on price movements.) For example, non-commercial traders held about 18 percent of open interest contracts on December 5, 1995, and 17 percent of open interest contracts on December 5, 2000, but this level has increased to 48.8 percent of open interest futures contracts on December 6, 2005. There are several dozen non-commercial traders holding these latest open interest contracts. In addition, a small number of banks hold a significant portion of the open interest futures contracts. On December 6, 2005, just five U.S. banks held 8.8 percent of total open interest, and another nine non-U.S. banks held 12.1 percent. Although one might assume that banks are non-commercial traders, the CPUC has not confirmed that. (A random check at an earlier date, October 3, 2000, found that banks held about 9 percent of total open interest, so the portion being held by banks may be increasing.)

Although futures prices may or may not be a good predictor of actual cash prices of natural gas, the CPUC believes the futures price of natural gas strongly influences the direction of the cash or physical market. Of course, simply because a large position is held in the futures and options market by speculators does not mean that price manipulation is occurring, even if the activity on the financial market is influencing the physical price of natural gas.

Appendix I.F: How California's Natural Gas Consumers Procure and Take Delivery of Natural Gas

California's Natural Gas Consumers

California natural gas consumers can be basically categorized into the following groups:

- Residential
- Small and large commercial
- Industrial
- Electric generation
- Enhanced oil recovery (EOR)
- Wholesale customers
- Natural gas vehicles.

Regulated natural gas utilities deliver about 80 percent of the natural gas in California. These utilities deliver natural gas to all of the above types of customers. The remaining 20 percent of natural gas is delivered directly to customers off interstate pipelines, or from California production areas. These consumers are typically referred to as “bypass” customers, and are mainly electric generation and EOR consumers.

Residential consumers are by far the most numerous. California gas utilities deliver natural gas to roughly 10.3 million residential customers. However, these customers use far less natural gas per customer than a typical industrial or electric generation customer. While there are only a few thousand industrial customers and a few hundred electric generation customers, these larger customers consume about two-thirds of the natural gas delivered to California.

California utility customers are often placed in two broad categories, core and noncore. Core customers include residential and small commercial customers, some larger commercial customers, and some NGV customers. Noncore customers are generally all of the other types of customers listed above. Noncore service is provided to customers whose meters are sized to receive more than 20,800 therms per month of natural gas, while a typical residential customer uses about 50 therms per month.

California's Natural Gas Utilities Provide Comprehensive “Bundled” Service to Almost All Core Customers

California natural gas utilities may perform a wide variety of services for their customers, including procurement, delivery, storage, and metering and billing. Core customers have had the option to take procurement service from non-utility suppliers since the early 1990's, but the vast majority of core customers choose utility procurement service. In addition to procurement, the utility also provides all other services for these “bundled” core customers. (Less than 5 percent of core residential customers choose a non-utility supplier, referred to as a “core aggregator”, for procurement service.) As part of its procurement service, the utility purchases natural gas from suppliers and marketers, obtains firm interstate pipeline capacity rights, and in PG&E's and SoCalGas' case, provides storage services. (Other natural gas utilities such as SDG&E and

Southwest Gas, which do not have storage fields in their service territory, are not required by the Energy Commission to hold storage capacity for their customers, but these utilities generally find it advantageous to do so, for economic and reliability considerations.)

California natural gas utilities do not own any natural gas production. They must purchase their supplies either from suppliers in the natural gas basins referred to above, or at the California border from marketers or other firms. Over 90 percent of utility natural gas supplies are purchased in the basin, rather than at the border. The utilities do not earn a “return” on these purchases, and must simply pass on its costs to ratepayers. However, as an incentive to do a good job purchasing supplies, the utility may earn a small reward if its purchases are made at prices below market indices. The utility may incur a penalty if its purchases are made at prices above market indices.

The supplies purchased in the basin are then transported to California on interstate pipelines. In order to assure that reliable deliveries are made for core customers, the Energy Commission requires PG&E, SoCalGas, and SDG&E to hold certain amounts of firm interstate pipeline capacity rights.

Once supplies are delivered into the two California utility transmission systems (PG&E and SoCalGas), those supplies are either delivered directly to core customers or to natural gas storage fields for injection. During periods when supplies delivered from interstate pipelines are inadequate to serve core customers, usually in the winter, natural gas is withdrawn from storage.

Noncore Customers Mainly Procure Their Own Supplies, Most Use Marketers

Since the late 1980s/early 1990s, noncore customers overwhelmingly have procured their own natural gas supplies. Noncore customers (other than electric generation and EOR customers) may choose to have the utility provide procurement service, but such noncore customers must then take core service (and pay the core transportation rate) for a minimum period of five years.

Some noncore customers also directly obtain firm interstate pipeline capacity rights or storage capacity rights for their supplies. But most noncore customers typically work with marketers to obtain their supplies, and the marketer itself may have firm interstate pipeline or storage capacity rights. As noted in response to Senator Escutia’s questions, few noncore customers hold interstate pipeline capacity rights.

Some California Consumers Take Gas Delivery from Non-Utility Systems

Bypass customers consumed about 20 percent of the natural gas used in California in 2004. About 57 percent of these supplies were delivered from the Kern River interstate pipeline, and about 35 percent were delivered directly from California producers. The remainder was delivered from the Mojave pipeline.

These customers are mainly EOR and electric generation customers. While the CPUC and Energy Commission don’t have much direct knowledge about the specific supply arrangements

of these customers, we expect that these customers would enter into procurement arrangements similar to noncore customers on the utility systems. That is, some may enter into their own arrangements directly for interstate pipeline service, but many would simply allow marketers to provide overall procurement services. Firms taking deliveries from California producers may also enter into supply arrangements directly with a producer or may purchase aggregated supplies from a marketer.

California Electric Utilities, Often in Conjunction with the California Department of Water Resources, Purchase a Significant Amount of Natural Gas

The major regulated electric utilities in California directly purchase a small portion of the natural gas supplies used for electric generation, and are responsible for making natural gas procurement decisions for the DWR. The natural gas supplies that these electric utilities directly procure are for the power plants they own and operate or for “gas tolling” arrangements for electric supply contracts. (“Gas tolling” occurs under an electric contract that allows the purchaser of the electricity to procure natural gas supplies for the electric generation.) The electric utilities are also responsible for gas tolling procurement decisions under DWR electric contracts, although the DWR must still pay the costs of such procurement.

The amount of natural gas purchased by the electric utilities, either directly or for the DWR, is substantial. A recent CPUC Energy Division report noted that electric generators providing power to customers of California investor-owned utilities were burning about 1800 Mmcfd in 2005, and the California electric utilities were responsible for procuring about a third of that amount.

Appendix I.G: Development of Natural Gas Price Indices and NYMEX Prices

Intelligence Press, Inc, has published the Natural Gas Intelligence (NGI) gas wholesale price index for the past 20 years. NGI has established guidelines for data providers to improve the quality of the natural gas price survey data. These guidelines ask that those providing data (1) report all negotiated, fixed-price, non-affiliate natural gas transactions for both daily and monthly (bidweek) baseload delivery. (2) The guidelines specify that each transaction should be listed separately and should include the trading location, transaction date, beginning flow date, ending flow date, volume, price (\$/MMBtu), buy/sell indicator, and counterparty. (3) NGI specifies that the data be provided from a central, non-commercial reporting source within the company. Lastly, data providers are asked to send price data by a time deadline, list contact information, and notify NGI of errors as soon as possible.

When NGI receives data from its various sources, it is separated into component trades and pricing locations and is given a reasonableness check (to ferret out typos and transcription mistakes). Once data from all submissions has been initially processed, each data set for each location is individually examined to identify any irregular data. Irregular data may be either price or volume levels that are not confirmed by more than one source, extremely low volume, if there is an indication that special provisions were tied to the transaction, or if the transaction was not conducted at arms length. If irregular data is determined to have been placed in an incorrect pricing location, corrections are made. When the source of an irregularity cannot be explained, NGI may exclude it from the index. If NGI notices a pattern of persistent irregular reporting, it may contact the company involved. If the problem is not resolved, NGI may decide to exclude all information submitted by that company, but will take that step only after a formal complaint has been sent to the company's directors.

Once irregular, inappropriate or non-applicable reports have been excluded, NGI is left with a set data set at each location from which a low, high, and average price can be published. A volumetric weighted average is calculated. If the total volume of reports at a given location for a bid week is below 25,000 MMBtu/d and NGI determines, given other available market information that the resulting weighted average is an inadequate representation of market activity, then an assessment is made using the other available market information and these locations are published marked with an asterisk (*). If the totality of the information is inadequate, NGI does not publish an index. NGI will correct errors within two business days of the posting of the original index and generally only if the error results in an index that diverges by at least 1 percent from the originally published index posting.

Platts' North American publishes its natural gas price surveys in Platts' Gas Daily and incorporates price reporting standards that went into effect July 1, 2003, as well as taking into consideration standards for price reporting in the FERC's policy statement on U.S. gas and electricity markets.¹²

¹² FERC's Policy Statement PL03-3.

Platts' price indexes are based on original reporting and do not incorporate publicly available price surveys. Prices are collected firsthand from actual buyers and sellers. Platts requires that data submitted must be detailed, transaction-level data. It expects reported data to include all transactions done by an entity at all locations reported by Platts, not a selective subset of these locations. Transactions are to be listed individually and include delivery point, price (\$/MMBtu), volume (MMBtu/day) source, buy/sell indicator, trade date, start flow date, end flow date, counterparty name and intermediary name (Broker or trading platform) and daily time stamps where possible. Price reports are to be compiled and sent by individuals who are separate from the trading activities of the reporting company.

Once Platts' receives the data, it begins the process of calculating the indexes and making assessments. A number of data sorts, statistical calculations and tests are performed on the collected transactional data. These include an analysis of the quality and completeness of each pricing point's survey sample, the identification and consideration of anomalous or outlying deals, a comparison of volume-weighted average prices for each data submitter and the calculation of a number of overall measures of central tendency, including the volume-weighted average, the median, the simple average, the mode and the midpoint. Other statistical and analytical tools are also used to examine the reported data, including identification and consideration of the price series' skew, its standard deviation, distribution, the relationship between series data and that of related trading point, and the quality or track record of the survey participants reporting prices at the point. To derive the index, Platts' uses volume-weighted averages as the foundation. At pricing points with robust deal making, and a generally normal distribution curve, Platts' uses the simple volume-weighted average. Platts' also considers the median of the price series in a thinner and/or very volatile market. When the two measures significantly diverge, an analysis of the data set is undertaken.

To identify non-applicable outliers, transactions greater than two and three standard deviations from the data series' mean are routinely flagged by Platts' technology system. Various tests are then used to determine whether to use an outlying price when calculating prices to be published. Revisions to reported prices are not made for reasons other than human or computational errors.

The NYMEX is the world's largest physical commodity futures exchange and the preeminent trading forum for energy. Natural gas futures contracts on the NYMEX are available for trading for 72 months into the future. As a practical matter, the most actively traded and volatile contract months are those that are within a few months of a contract's expiration. Most of the futures contracts traded on the Exchange are physically delivered contracts, although less than 1 percent of the commodities traded are actually bought or sold through the Exchange. The futures contract trades in units of 10,000 MMBtu. The price is based on delivery at the Henry Hub in Louisiana, the nexus of 16 intra- and interstate natural gas pipeline systems that draw supplies from the region's prolific gas deposits.

NYMEX futures natural gas prices are determined in an open and continuous auction on the Exchange floor by members (traders) acting on behalf of their customers, or themselves in a process of auction called open outcry. When a trade is executed, Exchange employees standing in the ring facing the traders key a trade into the Exchange's computer system for the first time

using hand-held devices, for dissemination to news services. In this first reporting, only the commodity, price, and delivery month are entered.

When a trade is executed, each selling broker must record each transaction on a card which shows the commodity, quantity, delivery month, price, broker's badge name, and that of the buyer. The pit card must be tossed into the center of the trading ring within one minute of the completion of a transaction. The pit-card clocker, who sits in the center of the trading ring, time-stamps the card which is then rushed to the data entry room, where the complete transaction data is keyed into the Exchange central computer system. The card itself is then scanned into the computer system, creating an unalterable image as part of the archive. Both buyers and sellers on the NYMEX also fill out trading cards which are submitted to the Exchange at the end of the day. This system is the only dual audit trail that exists at any exchange. All buy and sell transactions are reconciled from these cards.

The NYMEX has margin requirements, price and position limit, and other rules and regulations in place to provide a fair and orderly market. The NYMEX compliance department has three divisions to ensure that these rules are followed: They are the Market, Financial, and Trade Surveillance divisions.

The NYMEX monitors market participants through daily market surveillance, analyzing speculative and commercial participation and examining the relationship between trading activity on the Exchange and fundamental factors in the cash market. Market surveillance is required under CFTC regulations. Each day, the compliance staff compiles a profile of participants, identifying members and their customers holding reportable positions. In addition, daily surveillance is performed to ensure that Exchange prices reflect cash market price movements, that the futures market converges with the cash market at contract expiration, and that there are no price distortions and no market manipulation. Surveillance meetings are held at least weekly to review research reports on fundamental economic factors affecting each commodity.

The NYMEX financial surveillance staff serves in an audit capacity, ensuring that clearing members continually meet all minimum capital requirements. Original and variation margin collections and payments, as well as member position limits are monitored on a daily basis. A risk management division was established in April 2003, to minimize the effect of any material losses incurred by market participants on the Exchange. The Exchange employs a series of risk controls to ensure its own financial integrity, including the application and analysis of periodic market "stress tests" that run through scenarios of the effects of certain price movements and market volatility. Regular reviews of potential adverse trends based on cumulative variation margin settlements and market concentration are conducted. A daily analysis of each contract's margin rate is also conducted in order to address the market's current volatility. The Exchange may deem the financial condition of a member inadequate and prohibit a firm from entering into additional transactions.

Trade surveillance is monitored by analysts trained to spot instances of misconduct, including "front running" or trading ahead of a customer; wash or accommodation trading (transactions which create the appearance of trading activity, but which have no real economic effect); prohibited cross trading, prearranged trading and non-competitive trading. If a transaction

appears suspicious, an official investigation is launched. The Exchange obtains the broker's original trading cards, pit cards, order tickets, branch order ticket, and additional carbon copies of trading cards. It also identifies key opposite brokers and collects their trading records. These documents allow systematic reconstruction of the chronology of each transaction.

APPENDIX II: Natural Gas Producers and Production

Table II.1: Top Natural Gas Producers in Basins Serving California by State

California 2004	Texas 2004	Wyoming 2004	New Mexico 2004	Canada*
Occidental Elk Hills	Devon Energy	ExxonMobil	Burlington Resources	EnCana Corp
Aera Energy	Conoco Phillips	McMurry Oil	Conoco Phillips Co	Canadian Nat Res
Calpine Natural Gas	XTO Energy	Chevron USA	Devon Energy Production	Petro Canada
Chevron Texaco E&P	Exxon Mobil	BP America	BP America	Talisman Energy
Plains E&P	EOG Resources	Burlington Resources	Yates Petroleum	Husky Energy Inc
Vintage Petroleum	El Paso Production	Devon Energy	Marathon Oil	Nexen Inc
Venoco Inc	Chevron USA	Merit Energy	Chevron USA	Suncor Energy
Oxy Resources	Anadarko E&P	Lance Oil & Gas	XTO Energy	Devon Canada
Seneca Resources	BP America Production	Wexpro Co	Williams Production	Conoco Phillips Can
Royale Energy	Anadarko Petroleum	Shell Rocky Mtn	Energen Resources	Burlington Res. Canada
Crimson Resource	Chesapeake Operating	Williams Production	Marbob Energy Corp	Shell Canada
ABA Energy Corp	Shell Western E&P	Ultra Resources	El Paso Energy	Hurricane Hydrocarbs
THUMS Long Beach	Samson Lone Star	Questar Exploration	Occidental Permian	Anadarko Canada Corp
Lario Oil & Gas	Dominion Okla-TX E&P	Brown Tom Inc	Mewbourne Oil	BP Canada Energy
TexCal Energy	Houston Exploration	EOG Resources	Apache Corp	Penn West Petroleum
Towne Exploration	Mobil Producing TX	Anadarko E&P	EOG Resources	Chevron Canada Res.
Aspen Exploration	Newfield Exploration	Huber JM	Gruy Petro Management	Murphy Oil Co.
Pioneer Exploration	Devon Louisiana	Yates Petroleum	Pure Resources	
Termo Company	Westport Oil and Gas	Pennaco Energy	Chesapeake Operating	
DC Slawson Expl Co	Pioneer Nat Resources	Bill Barrett Corp	OXY USA	

* Top "Alberta-based oil and gas producers," 3rd quarter 2002, ranking based on total Canadian oil and gas energy equivalent production

Table II.2: Top Producers by State, with 2004 Production and Percentage of State Total**Wyoming**

Producer	2004 Production (MMcf)	% of State Total
Exxon Mobil	237,057	12.3%
McMurry Oil	198,985	10.3
Chevron USA	165,514	8.6
BP America	161,007	8.4
Burlington Resources	155,030	8.0
Devon Energy	92,471	4.8
Merit Energy	82,536	4.3
Lance Oil & Gas	53,340	2.8
Wexpro Co	51,473	2.7
Shell Rocky Mtn	50,828	2.6
Williams Production	50,812	2.6
Ultra Resources	47,419	2.5
Questar Exploration	46,229	2.4
Brown Tom	42,483	2.2
EOG Resources	40171	2.1
TOTAL of Top 15		76.6%

New Mexico

Producer	2004 Production (MMcf)	% of State Total
Burlington Resources	383,965	23.8%
Conoco Phillips Co	231,892	14.4
Devon Energy Production	117,438	7.3
BP America	109,082	6.8
Yates Petroleum	71,439	4.4
Marathon Oil	45,063	2.8
Chevron USA	43,000	2.7
XTO Energy	41,671	2.6
Williams Production	41,256	2.6
Energen Resources	39,858	2.5
Marbob Energy Corp	20,006	1.2
El Paso Energy	19,510	1.2
Occidental Permian	17,305	1.1
Mewbourne Oil	17,264	1.1
Apache Corp	14,873	0.9
TOTAL of Top 15		75.4%

Texas

Producer	2004 Production (MMcf)	% of State Total
Devon Energy	337,203	6.9
Conoco Phillips	245,910	5.0
XTO Energy	223,153	4.6
Exxon Mobil	195,554	4.0
EOG Resources	173,877	3.6
El Paso Production	144,774	3.0
Chevron USA	144,474	3.0
Anadarko E&P	131,654	2.7
BP America Production	125,152	2.6
Anadarko Petroleum	116,512	2.4
Chesapeake Operating	103,004	2.1
Shell Western E&P	99,082	2.0
Samson Lone Star	95,541	2.0
Dominion Okla-TX E&P	85,218	1.7
Houston Exploration	73,371	1.5
TOTAL of Top 15		47.1%

California

Producer	2004 Production (MMcf)	% of State Total
Occidental Elk Hills	127,852	39.2%
Aera Energy	27,492	8.4
Calpine Natural Gas	21,057	6.5
Chevron Texaco E&P	12,892	3.9
Plains E&P	12,439	3.8
Vintage Petroleum	9,075	2.8
Venoco Inc	8,839	2.7
Oxy Resources	3,687	1.1
Seneca Resources	4,900	1.5
Royale Energy	4,255	1.3
Crimson Resource	3,761	1.2
ABA Energy Corp	3,493	1.1
THUMS Long Beach	3,115	1.0
Lario Oil & Gas	2,432	0.7
TexCal Energy	2,407	0.7
TOTAL of Top 15		75.9%

APPENDIX III: Market Concentration Tables
Profiles of Companies Involved in California Natural Gas Market

Company	Company Description	Total Assets ⁱ	Total Natural Gas Reserves ⁱⁱ	Total Oil Reserves ⁱⁱⁱ	Total MW Capacity ^{iv}
Anadarko Petroleum Corp.	Anadarko primarily engages in the exploration, development, production, and marketing of natural gas, crude oil, condensate, and natural gas liquids. North American oil and gas production in Western Canada, Rockies, Permian, Mid-Continent, Texas/Louisiana and Gulf of Mexico. Significant production in Algeria.	\$22.0 billion	<i>Global:</i> 7.5 Tcf <i>North America:</i> 7.4 Tcf	1.1 Bbbl	None
ArcLight Capital Partners	ArcLight Capital Partners is a privately-controlled energy investment firm with more than \$2.5 billion under management. ArcLight invests in hard assets in various segments of the energy industry. Investments in power generation, production, midstream, transmission and distribution.	Not available	Not available	Not available	Not available
Black Hills Corporation	Black Hills is a diversified energy company. Wholesale energy operations include electricity generation, natural gas and oil production, coal mining and energy marketing. Retail operations include Black Hills Power, an electric utility, providing service to the Black Hills region and Cheyenne Light, Fuel & Power, a Wyoming electric and gas distribution company.	\$2.3 billion	<i>US:</i> 142.0 Bcf	5.2 MMbbl	<i>Wholesale:</i> 964 MW <i>Regulated:</i> 435 MW
BP plc	BP's primary activities are the exploration and production of crude oil and natural gas; refining, marketing, supply and transportation; and the manufacture and marketing of petrochemicals. BP also has a growing presence in gas and power and in solar power generation.	\$214.3 billion	<i>Global:</i> 48.5 Tcf <i>Americas:</i> 28.8 Tcf <i>US:</i> 14.1 Tcf	9.9 Bbbl	Not available—primarily cogeneration

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	California Supply Basins with Natural Gas Production^{v,vi}	Gas Processing in California Supply Basins^{vii}	Ownership of Interstate Pipelines Directly Serving California^{viii}	California Interstate Pipelines on which Capacity Is Held^{ix,x}	California Storage Ownership
Anadarko Petroleum Corp.	Rockies Western Canada Permian 7 th largest operator in US	Small processing plants in Colorado	None	Kern (Duke acts as agent)	None
ArcLight Capital Partners	None	None	None	None	Lodi (100% owner) Proposed Kirby Hills facility
Black Hills Corporation	Rockies San Juan Small producer	Minority interest in small Rockies plant	None	Kern (agent for Nevada Power Co.)	None
BP plc	San Juan Rockies Western Canada 3 rd largest producer in North America Largest operator in US	Ownership of large Wattenberg plant in Colorado; three large plants in Wyoming	None	El Paso & Mohave GTN Kern Transwestern 6 th largest capacity owner in California in 2004 with 3.5% market share	None

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Natural Gas Marketing^{xi}	California Retail Gas Supplier^{xii}	Generation in California and Western Region	Other
Anadarko Petroleum Corp.	#25 North American gas marketer	No	None	None
ArcLight Capital Partners	None	No	Interests in ten gas-fired power plants and three gas-fired cogeneration facilities in California	Provided funding for Path 15 transmission upgrade.
Black Hills Corporation	#21 North American gas marketer (Enserco Energy); focused on moving gas to western markets from Rockies and Canada.	Yes (Enserco)	251 MW gas-fired plants in Las Vegas, Nevada 104 MW gas-fired cogeneration plants in California	None
BP plc	#1 North American gas marketer	Yes	Significant cogeneration in California	Significant ownership of Alaskan gas reserves. Registered electric service provider in California.

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Company Description	Total Assetsⁱ	Total Natural Gas Reservesⁱⁱ	Total Oil Reservesⁱⁱⁱ	Total MW Capacity^{iv}
Calpine Corp.	Calpine is a North American power company that generates power from natural gas-fueled and geothermal power plants. The company generates power at plants it owns or leases in 21 states in the United States and in three Canadian provinces.	\$27.1 billion; filed for Chapter 11 protection on 12/20/05.	None	None	26,500 MW (9/30/05)
Chevron Corp.	ChevronTexaco engages in fully integrated petroleum operations, chemicals operations, coal mining, power and energy services. The company conducts business activities in the United States and approximately 180 other countries.	\$124.8 billion	<i>Global:</i> 26.3 Tcf <i>US:</i> 5.1 Tcf	8.7 Bbbl	Not available—primarily cogeneration
ConocoPhillips /Burlington Resources Inc.	ConocoPhillips is an integrated energy company. The company has four core activities worldwide: petroleum exploration and production; petroleum refining, marketing, supply and transportation; natural gas gathering, processing and marketing; and chemicals and plastics production and distribution.	\$122.3 billion	<i>Global:</i> 25.9 Tcf <i>North America:</i> 16.0 Tcf	6.2 Bbbl	Not available—primarily cogeneration in Gulf Coast

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	California Supply Basins with Natural Gas Production^{v,vi}	Gas Processing in California Supply Basins^{vii}	Ownership of Interstate Pipelines Directly Serving California^{viii}	California Interstate Pipelines on which Capacity Is Held^{ix, x}	California Storage Ownership
Calpine Corp.	None	None	None	GTN Kern Transwestern 7 th largest capacity owner in California in 2004 with 3.3% market share	None
Chevron Corp.	California Rockies Permian San Juan Top 10 North American producer 3 rd largest operator in US	Plants in California, Colorado and Utah	None	El Paso & Mohave GTN Kern Transwestern 4 th largest capacity owner in California in 2004 with 4.2% market share	None
ConocoPhillips /Burlington Resources Inc.	San Juan (#1 producer) ^{xiii} Rockies Permian Western Canada Largest North American producer 2 nd largest operator in US	50% of Blanco plant in San Juan; 50% owner of Duke Energy Field Services, a large processing company in the Rockies and Permian	None	<i>ConocoPhillips:</i> El Paso (agent for Mexicana de Cobre) GTN Transwestern <i>Burlington:</i> El Paso & Mohave GTN	None

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Natural Gas Marketing^{xi}	California Retail Gas Supplier^{xii}	Generation in California and Western Region	Other
Calpine Corp.	#14 North American gas marketer	Yes	8,400 MW gas-fired and geothermal in WECC operating and under construction as of 12/31/04	Registered electric service provider in California
Chevron Corp.	#5 North American gas marketer	Yes	Significant cogeneration in California	25% equity ownership in Dynegy, which is involved in power generation.
ConocoPhillips /Burlington Resources Inc.	#2 North American gas marketer	Yes	None	Partner in proposed LNG terminal at Long Beach. Significant ownership of Alaskan gas reserves.

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Company Description	Total Assets ⁱ	Total Natural Gas Reserves ⁱⁱ	Total Oil Reserves ⁱⁱⁱ	Total MW Capacity ^{iv}
Constellation Energy Group Inc. ^{xiv}	<p>Constellation Energy is a North American energy company which includes a merchant energy business and BGE, a regulated electric and gas public utility in central Maryland. Wholesale activities include generation and wholesale and retail marketing of electricity and gas.</p> <p>FPL Group owns a rate-regulated utility, FPL, and a wholesale generation business.</p>	<p><i>Constellation:</i> \$22.9 billion</p> <p><i>FPL Group:</i> \$33.6 billion</p>	None	None	<p><i>Constellation:</i> 12,532 MW</p> <p><i>FPL Group:</i> 11,520 MW</p>
Devon Energy Corp.	Devon Energy is an independent energy company engaged primarily in oil and gas exploration, development and production, the acquisition of producing properties, the transportation of oil, gas, and NGLs and the processing of natural gas.	\$29.5 billion	<p><i>Global:</i> 7.5 Tcf</p> <p><i>North America:</i> 7.4 Tcf</p>	828 MMbbl	None
Duke Energy ^{xv}	<p>Duke Energy is a diversified energy company. The company generates, transmits, distributes and sells electricity in North Carolina and South Carolina; provides transportation and storage of natural gas for customers along the U.S. East Coast, the Southeast, and in Canada; gathers, processes, transports, trades and markets, and stores natural gas and NGLs; and operates power plants and markets electric power and natural gas related to these plants and other contractual positions.</p> <p>Cinergy's businesses include wholesale generation and energy marketing and trading activities; regulated generation, transmission and distribution operations in Indiana through PSI; and regulated electric and gas transmission and distribution in Ohio and Kentucky through CG&E.</p>	<p><i>Duke:</i> \$53.3 billion</p> <p><i>Cinergy:</i> \$17.5 billion</p>	None	None	<p><i>Duke:</i> 21,800 MW</p> <p><i>Cinergy:</i> 13,331 MW</p>

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	California Supply Basins with Natural Gas Production^{v,vi}	Gas Processing in California Supply Basins^{vii}	Ownership of Interstate Pipelines Directly Serving California^{viii}	California Interstate Pipelines on which Capacity Is Held^{ix, x}	California Storage Ownership
Constellation Energy Group Inc.^{xiv}	None	None	None	Shipper on Kern High Desert Lateral to power plant	None
Devon Energy Corp.	San Juan Rockies Permian Western Canada 5 th largest operator in US	Two plants in Wyoming	None	GTN	None
Duke Energy^{xv}	None	50% owner of Duke Energy Field Services (DEFS), a large gathering and processing company in the Rockies and Permian	None	El Paso (DEFS acts as agent) GTN Kern (agent for Anadarko) TW 9 th largest capacity owner in California in 2004 with 3.0% market share	None

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Natural Gas Marketing^{xi}	California Retail Gas Supplier^{xii}	Generation in California and Western Region	Other
Constellation Energy Group Inc. ^{xiv}	#7 North American gas marketer	Yes	<i>Constellation:</i> 1,004 MW in WECC, primarily 830 MW High Desert Power Plant in California <i>FPL:</i> 1,950 MW in WECC, including wind and gas-fired in California	Registered electric service provider in California.
Devon Energy Corp.	#17 North American gas marketer	No	None	None
Duke Energy ^{xv}	Some gas marketing through DEFS	Yes	None	None

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Company Description	Total Assetsⁱ	Total Natural Gas Reservesⁱⁱ	Total Oil Reservesⁱⁱⁱ	Total MW Capacity^{iv}
Edison International	Edison International owns three principal operating subsidiaries. Southern California Edison provides electricity to retail customers in central, coastal and southern California. Edison Mission Energy is engaged in the business of owning or leasing, operating and selling energy and capacity from electric power generation facilities. Edison Capital invests worldwide in energy and infrastructure projects.	\$35.5 billion	None	None	<i>Total:</i> 13,828 MW <i>Edison Mission:</i> 8,834 MW (5,876 MW in IL, 1,884 MW in PA) <i>SCE:</i> 4,994 MW
El Paso Corp.	El Paso provides natural gas and related products in North America. Businesses include natural gas transmission and storage, exploration and production, marketing and trading and power generation.	\$31.7 billion	<i>US:</i> 1.7 Tcf	51.5 MMbbl	839 MW (in Michigan and Massachusetts)
Encana Corp.	Encana is an independent exploration and production company focused on North America. EnCana's midstream activities are comprised of natural gas storage operations, NGLs processing and storage, power generation operations and pipelines. The company's marketing groups are focused on enhancing the sale of the company's proprietary production.	\$33.4 billion	<i>North America:</i> 10.5 Tcf	501 MMbbl	None
Exxon Mobil Corp.	ExxonMobil's principal business is energy, involving exploration and production, manufacture of petroleum products and transportation and sale of crude oil, natural gas and petroleum products. ExxonMobil is a major manufacturer and marketer of petrochemicals. ExxonMobil also has interests in electric power generation facilities.	\$209.7 billion	<i>Global:</i> 31.8 Tcf <i>North America:</i> 14.2 Tcf	8.4 Bbbl	Not available

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	California Supply Basins with Natural Gas Production^{v,vi}	Gas Processing in California Supply Basins^{vii}	Ownership of Interstate Pipelines Directly Serving California^{viii}	California Interstate Pipelines on which Capacity Is Held^{ix, x}	California Storage Ownership
Edison International	None	None	None	<i>Edison Mission:</i> Kern	None
El Paso Corp.	Rockies San Juan	None	El Paso, including Mohave (100% ownership) 33% market share in 2004	<i>El Paso Marketing:</i> El Paso Kern Transwestern <i>El Paso Natural Gas:</i> Mohave	None
Encana Corp.	Rockies Western Canada 2 nd largest producer in North America 10 th largest operator in US	None	None	GTN	Wild Goose (100% owner); affiliates are prohibited from using facility, subject to CPUC decision
Exxon Mobil Corp.	Rockies California Western Canada Permian Top 10 North American producer 2 nd largest operator in US	Limited processing ownership	None	None	None

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Natural Gas Marketing^{xi}	California Retail Gas Supplier^{xii}	Generation in California and Western Region	Other
Edison International	None	No	<i>Edison Mission:</i> 1,934 MW gas-fired in California <i>SCE:</i> 4,994 MW serving California	Edison Mission is involved in power marketing and trading.
El Paso Corp.	#21 North American gas marketer; primarily markets its own production, continuing to liquidate historical portfolio.	No	None	Owner of the largest interstate pipeline system in the US.
Encana Corp.	#15 North American gas marketer; primarily markets its own production.	No	None	None
Exxon Mobil Corp.	#15 North American gas marketer; primarily markets its own production.	No	Not available—some cogeneration associated with Torrance refinery	Significant ownership of Alaskan gas reserves.

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Company Description	Total Assetsⁱ	Total Natural Gas Reservesⁱⁱ	Total Oil Reservesⁱⁱⁱ	Total MW Capacity^{iv}
General Electric Co.	GE is a large, diversified industrial corporation engaged in developing, manufacturing and marketing a wide variety of products for the generation, transmission, distribution, control and utilization of electricity. The company also has a large financial services subsidiary.	\$662.7 billion	None	None	None
Mid-American Energy Holdings Company^{xvi}	Mid-American Energy owns and operates a combined electric and natural gas utility company in the United States, two natural gas pipeline companies in the United States, two electricity distribution companies in the United Kingdom, a diversified portfolio of domestic and international independent power projects and the second largest residential real estate brokerage firm in the United States.	\$20.1 billion	None	None	<i>Total:</i> 5,420 MW <i>Regulated:</i> 4,481 MW <i>Wholesale:</i> 939 MW
Occidental Petroleum Corp.	Occidental explores for, develops, produces and markets crude oil and natural gas and manufactures and markets basic chemicals, vinyls and performance chemicals.	\$25.1 billion	<i>Global:</i> 3.0 Tcf <i>North America:</i> 2.1 Tcf	2.0 Bbbl	225 MW and cogeneration in Louisiana
PG&E Corp.	PG&E engages primarily in the businesses of electricity and natural gas distribution, electricity generation, procurement and transmission, and natural gas procurement, transportation and storage.	\$34.2 billion	None	None	6,420 MW (all in California)

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	California Supply Basins with Natural Gas Production^{v,vi}	Gas Processing in California Supply Basins^{vii}	Ownership of Interstate Pipelines Directly Serving California^{viii}	California Interstate Pipelines on which Capacity Is Held^{ix, x}	California Storage Ownership
General Electric Co.	None	None	Transwestern (50% ownership) 25% market share in 2004	None	None
Mid-American Energy Holdings Company^{xvi}	None	None	Kern River (100% ownership) 20% market share in 2004	Will hold GTN capacity upon close of PacifiCorp acquisition	None
Occidental Petroleum Corp.	California Permian 19 th largest operator in US	Plants in California and Texas	None	El Paso GTN Kern	None
PG&E Corp.	None	None	None	El Paso GTN Transwestern 2 nd largest capacity owner in California in 2004 with 11.6% market share	Los Medanos McDonald Island Pleasant Creek

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Natural Gas Marketing^{xi}	California Retail Gas Supplier^{xii}	Generation in California and Western Region	Other
General Electric Co.	None	No	None	None
Mid-American Energy Holdings Company^{xvi}	Some gas marketing in the Midwest	No	189 MW serving California, primarily geothermal	Pending acquisition of PacifiCorp, a regulated electric utility with 1.6 million retail customers in UT, OR, WY, WA, ID and CA.
Occidental Petroleum Corp.	Primarily markets its own production	Yes	225 MW in California	Registered electric service provider in California.
PG&E Corp.	None	Yes (utility)	6,420 MW—all utility-owned	None

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Company Description	Total Assetsⁱ	Total Natural Gas Reservesⁱⁱ	Total Oil Reservesⁱⁱⁱ	Total MW Capacity^{iv}
Questar Corp.	Questar Corporation is a natural gas-focused energy company with three principal lines of business—gas and oil exploration and production, interstate gas transmission, and retail-gas distribution. The company's operations are primarily in the Rocky Mountain region.	\$4.3 billion	<i>US:</i> 1.3 Tcf	27.2 MMbbl	None
Reliant Energy Inc.	Reliant Energy provides electricity and energy services to retail and wholesale customers in the United States. Reliant provides energy products and services to retail electricity customers in Texas, and also serves commercial, industrial and governmental/ institutional retail customers in the PJM Market.	\$13.7 billion	None	None	16,000 MW
Royal Dutch Shell plc	Royal Dutch Shell is an integrated oil and gas company that searches for, finds and produces crude oil and natural gas; builds and operates the infrastructure needed to deliver hydrocarbons to market; liquefies and transports natural gas, develops gas markets and infrastructure including gas-fired power plants and engages in the marketing and trading of natural gas and electricity; markets transportation fuels, lubricants and specialty products; refines, supplies, trades and ships crude oil and petroleum products; and produces and sells petrochemicals to industrial customers globally.	\$241.2 billion	<i>Global:</i> 38.0 Tcf <i>US:</i> 2.8 Tcf	5.2 Bbbl	Not available

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	California Supply Basins with Natural Gas Production^{v,vi}	Gas Processing in California Supply Basins^{vii}	Ownership of Interstate Pipelines Directly Serving California^{viii}	California Interstate Pipelines on which Capacity Is Held^{ix, x}	California Storage Ownership
Questar Corp.	Rockies 22 nd largest operator in US	Plants in Utah and Colorado	Southern Trails (100% ownership) 1% market share in 2004	Kern	None
Reliant Energy Inc.	None	None	None	El Paso Kern 5 th largest capacity owner in California in 2004 with 3.6% market share	None
Royal Dutch Shell plc	Rockies California Top 10 North American producer 6 th largest operator in US	Limited processing ownership	None	El Paso & Mojave Kern 10 th largest capacity owner in California in 2004 with 2.1% market share	None

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Natural Gas Marketing^{xi}	California Retail Gas Supplier^{xii}	Generation in California and Western Region	Other
Questar Corp.	Gas marketing concentrated on markets in the Pacific Northwest, Rocky Mountains and Midwest.	No	None	None
Reliant Energy Inc.	Gas purchases are primarily for the company's power plants.	Yes	3,976 MW in California and Nevada, all gas-fired	None
Royal Dutch Shell plc	#3 (tied) North American gas marketer (Coral Energy)	Yes (Coral)	Primarily cogeneration associated with refineries	Coral Energy is a registered electric service provider in California.

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Company Description	Total Assetsⁱ	Total Natural Gas Reservesⁱⁱ	Total Oil Reservesⁱⁱⁱ	Total MW Capacity^{iv}
Sempra Energy	Sempra Energy is an energy services holding company providing electric, natural gas, broadband, and related products and services in the United States through four segments: Southern California Gas Company (SoCalGas), San Diego Gas & Electric (SDG&E), Sempra Commodities, and Sempra Generation. SoCalGas is a natural gas distribution utility, serving a service territory encompassing 23,000 square miles in most of central and Southern California. SDG&E provides electric service to San Diego and southern Orange counties, and natural gas service to San Diego County. Sempra Commodities segment is a trading company that markets and trades physical and financial commodity products. Sempra Generation segment primarily acquires, develops, and operates power plants.	\$29.0 billion	None	None	<i>SDG&E:</i> 430 MW <i>Sempra:</i> 3,670 MW
Southern Union Company	Southern Union Company owns and operates assets in the regulated natural gas industry and is primarily engaged in the transportation, storage and distribution of natural gas in the United States.	\$5.7 billion	None	None	48 MW (in Pennsylvania)
Southwest Gas Corp.	Southwest Gas Corporation operates in the natural gas transmission and construction businesses. The company purchases, transports, and distributes natural gas in Arizona, Nevada, and California.	\$2.9 billion	None	None	None

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	California Supply Basins with Natural Gas Production^{v,vi}	Gas Processing in California Supply Basins^{vii}	Ownership of Interstate Pipelines Directly Serving California^{viii}	California Interstate Pipelines on which Capacity Is Held^{ix, x}	California Storage Ownership
Sempra Energy	None	None	None	<i>Sempra:</i> El Paso GTN Kern Transwestern <i>SoCalGas:</i> El Paso Transwestern <i>SDG&E:</i> El Paso Largest capacity owner in California in 2004 with 20.7% market share	Aliso Canyon Goleta Honor Rancho Playa Del Rey
Southern Union Company	None	None	Transwestern (50% ownership) 25% market share in 2004	None	None
Southwest Gas Corp.	None	None	None	El Paso Transwestern 3 rd largest capacity owner in California in 2004 with 5.9% market share	Small LNG storage facility in northern Nevada

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Natural Gas Marketing^{xi}	California Retail Gas Supplier^{xii}	Generation in California and Western Region	Other
Sempra Energy	#3 (tied) North American gas marketer	Yes (Sempra, SDG&E and SoCalGas)	<p><i>Sempra:</i> 2,390 MW in Arizona, Baja California, California and Nevada</p> <p><i>SDG&E:</i> 430 MW (Songs)</p>	Sempra LNG is developing the Energía Costa Azul LNG regasification terminal in Baja California, Mexico. Sempra Pipelines and Storage is developing the Rockies Express Pipeline with Kinder Morgan Energy Partners to transport gas from the Rockies to Ohio. Registered electric service provider in California.
Southern Union Company	None	No	None	None
Southwest Gas Corp.	None	Yes (utility)	None	None

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	Company Description	Total Assetsⁱ	Total Natural Gas Reservesⁱⁱ	Total Oil Reservesⁱⁱⁱ	Total MW Capacity^{iv}
TransCanada Corp.	TransCanada primarily engages in the natural gas transmission and power generation in the United States and Canada.	\$18.9 billion	None	None	5,700 MW in Canada and US
Williams Companies Inc.	Williams finds, produces, gathers, processes and transports natural gas. The company also manages a wholesale power business. Operations are concentrated in the Pacific Northwest, Rocky Mountains, Gulf Coast, Southern California and Eastern Seaboard.	\$33.7 billion	<i>US:</i> 2,986 Tcfe (includes oil and NGLs converted to gas-equivalent units)	None	7,710 MW

Market Concentration Tables (cont'd)
Profiles of Companies Involved in California Natural Gas Market

Company	California Supply Basins with Natural Gas Production^{v,vi}	Gas Processing in California Supply Basins^{vii}	Ownership of Interstate Pipelines Directly Serving California^{viii}	California Interstate Pipelines on which Capacity Is Held^{ix, x}	California Storage Ownership
TransCanada Corp.	None	None	GTN (100% ownership) 22% market share in 2004 Also, North Baja	None	None
Williams Companies Inc.	Rockies San Juan 20 th largest operator in US	Processing plants in Wyoming, Colorado and New Mexico	None	El Paso Kern	None

Company	Natural Gas Marketing^{xi}	California Retail Gas Supplier^{xii}	Generation in California and Western Region	Other
TransCanada Corp.	None	No	None	Ownership interests in major pipelines in Canada and between Canada and the midwestern US.
Williams Companies Inc.	#17 North American gas marketer	Yes	4,141 MW in California	Significant pipeline ownership outside of CA: Transcontinental Gas Pipe Line, Northwest Pipeline (Rockies to WA and OR), 50% interest in the Gulfstream Natural Gas System.

ⁱ Total Assets as of 9/30/05 from SEC filings.

ⁱⁱ Natural gas reserves are worldwide reserves as of 12/31/04 from company 10-K's, pro forma for significant mergers. North American and US reserves provided when available. If only a North American and/or US total is provided then the company only operates in North America and/or the US.

ⁱⁱⁱ Oil reserves are worldwide totals as of 12/31/04 from company 10-K's, pro forma for significant mergers.

^{iv} Total megawatts (MW) of generation capacity represents net ownership of capacity as of 12/31/2004 from company 10-K's, unless otherwise noted.

^v California Supply Basins include Western Canada, Rocky Mountains, San Juan, Permian and California in-state production.

^{vi} North American producer rankings assume closing of ConocoPhillips/Burlington merger. U.S. operator rankings are for 2004 from U.S. Energy Information Agency, U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves 2004 Annual Report. Rankings were adjusted for ConocoPhillips merger with Burlington and Chevron acquisition of Unocal.

^{vii} Information about gas processing ownership from "Gas Processing Survey." Oil & Gas Journal. June 27, 2005.

^{viii} 2004 market share from FERC, 2004 State of the Markets Report, June 2005, staff report by the Office of Market Oversight and Investigations, p. 200.

^{ix} Based on October 1, 2005 Index of Customers for each pipeline.

^x 2004 market share from FERC, 2004 State of the Markets Report, June 2005, staff report by the Office of Market Oversight and Investigations, p. 200.

^{xi} Ranking of North American gas marketers by wholesale physical volumes sold, third quarter 2005 from Gas Daily, December 12, 2005, p. 7.

^{xii} Companies identified as retail gas suppliers based on non-core gas supplier lists on PG&E, SoCalGas and SDG&E's websites as of 12/30/2005. Natural gas utilities also included.

^{xiii} Burlington Resources website, www.br-inc.com, cited December 13, 2005.

^{xiv} Merger with FPL Group announced Dec 19, 2005.

^{xv} Merger with Cinergy announced May 9, 2005.

^{xvi} 80.5% owned by Berkshire Hathaway Inc. and 19.5% owned by three individuals; Berkshire Hathaway has 9.9% voting interest; Walter Scott has voting control.